EXHIBIT E

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Cosic

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(54) **MACHINE LEARNING FOR COMPUTING ENABLED SYSTEMS AND/OR DEVICES**

(71) Applicant: **Jasmin Cosic**, Miami, FL (US)

(72) Inventor: **Jasmin Cosic**, Miami, FL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 67 days.

This patent is subject to a terminal disclaimer.

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(51) **Int. Cl.**

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G06N 5/02	(2006.01)
G06K 9/62	(2006.01)
G06T 7/70	(2017.01)
G06F 9/30	(2018.01)
G06N 20/00	(2019.01)
G06F 15/80	(2006.01)
G06F 15/78	(2006.01)

(52) **U.S. Cl.**

CPC ***G06K 9/66*** (2013.01); ***G06F 9/30076*** (2013.01); ***G06K 9/6202*** (2013.01); ***G06N 20/00*** (2019.01); ***G06T 7/70*** (2017.01); *G06F 15/78* (2013.01); *G06F 15/80* (2013.01); *G06N 5/022* (2013.01)

(58) **Field of Classification Search**

CPC .. G06K 9/00355; G06K 9/00389; G06K 9/66; G06T 2207/20081; G06F 3/002; G06F 3/005; G06F 3/017; G06N 5/022; G06N 5/025; G06N 20/00

See application file for complete search history.

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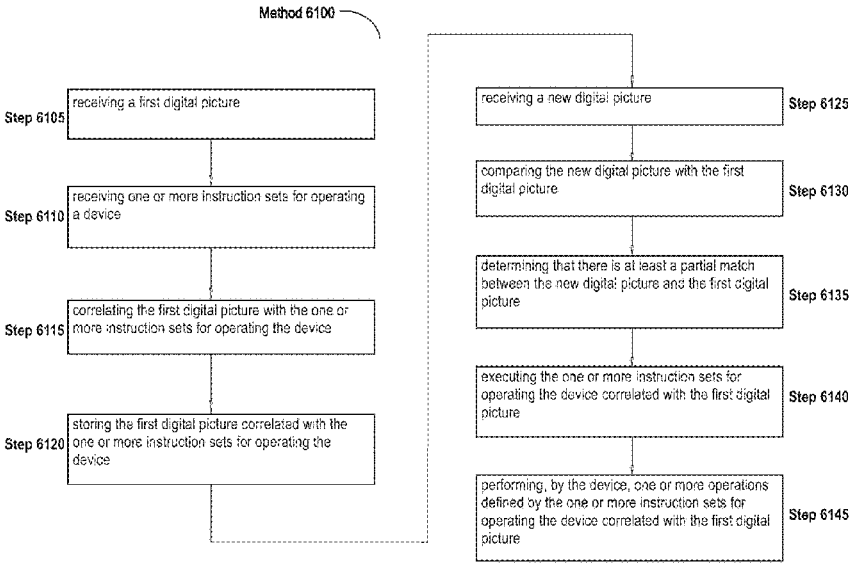
(57) **ABSTRACT**

Aspects of the disclosure generally relate to computing enabled systems and/or devices and may be generally directed to machine learning for computing enabled systems and/or devices. In some aspects, the system captures one or more digital pictures, receives one or more instruction sets, and learns correlations between the captured pictures and the received instruction sets.

34 Claims, 41 Drawing Sheets



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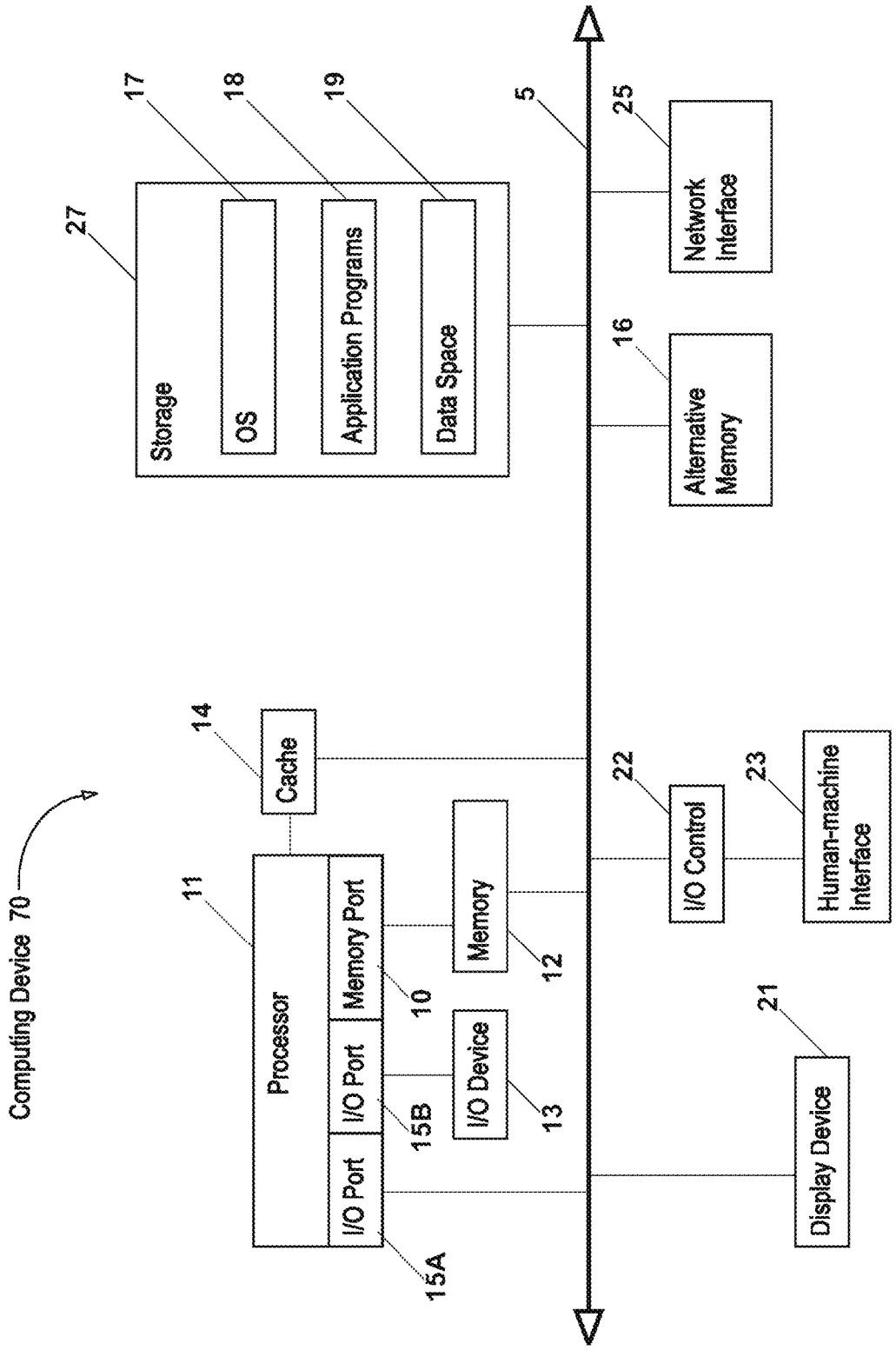

Computing Device 70
Processor
11
Cache
14
I/O Port
15A
I/O Port
15B
Memory Port
10
I/O Device
13
Memory
12
Storage
27
OS
17
Application Programs
18
Data Space
19
5
Network Interface
25
Alternative Memory
16
I/O Control
22
Human-machine Interface
23
Display Device
21

FIG. 1

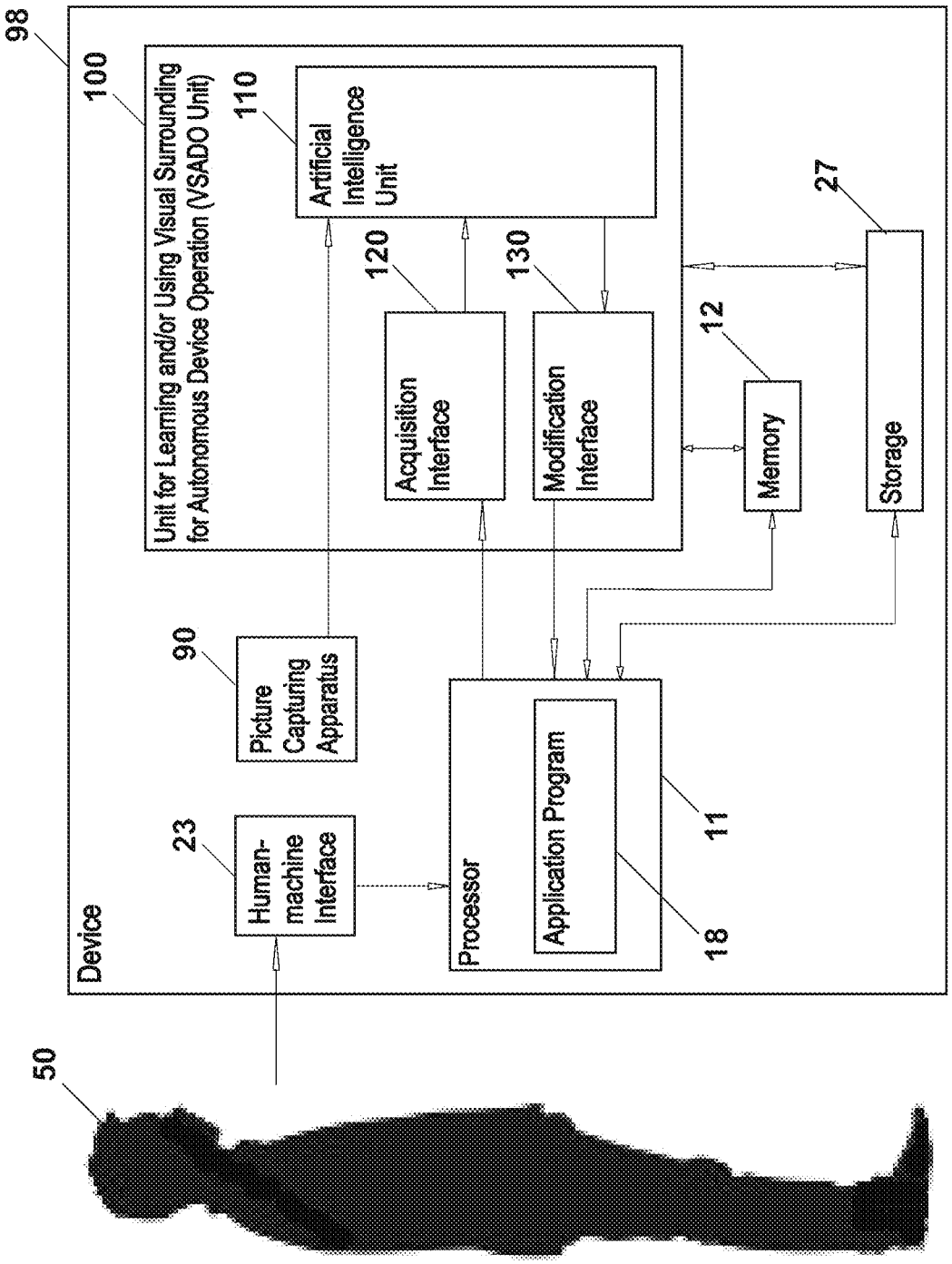

98
Device
100
Unit for Learning and/or Using Visual Surrounding for Autonomous Device Operation (VSADO Unit)
110
Artificial Intelligence Unit
120
Acquisition Interface
130
Modification Interface
12
Memory
27
Storage
90
Picture Capturing Apparatus
23
Human-machine Interface
Processor
Application Program
11
18
50

FIG. 2

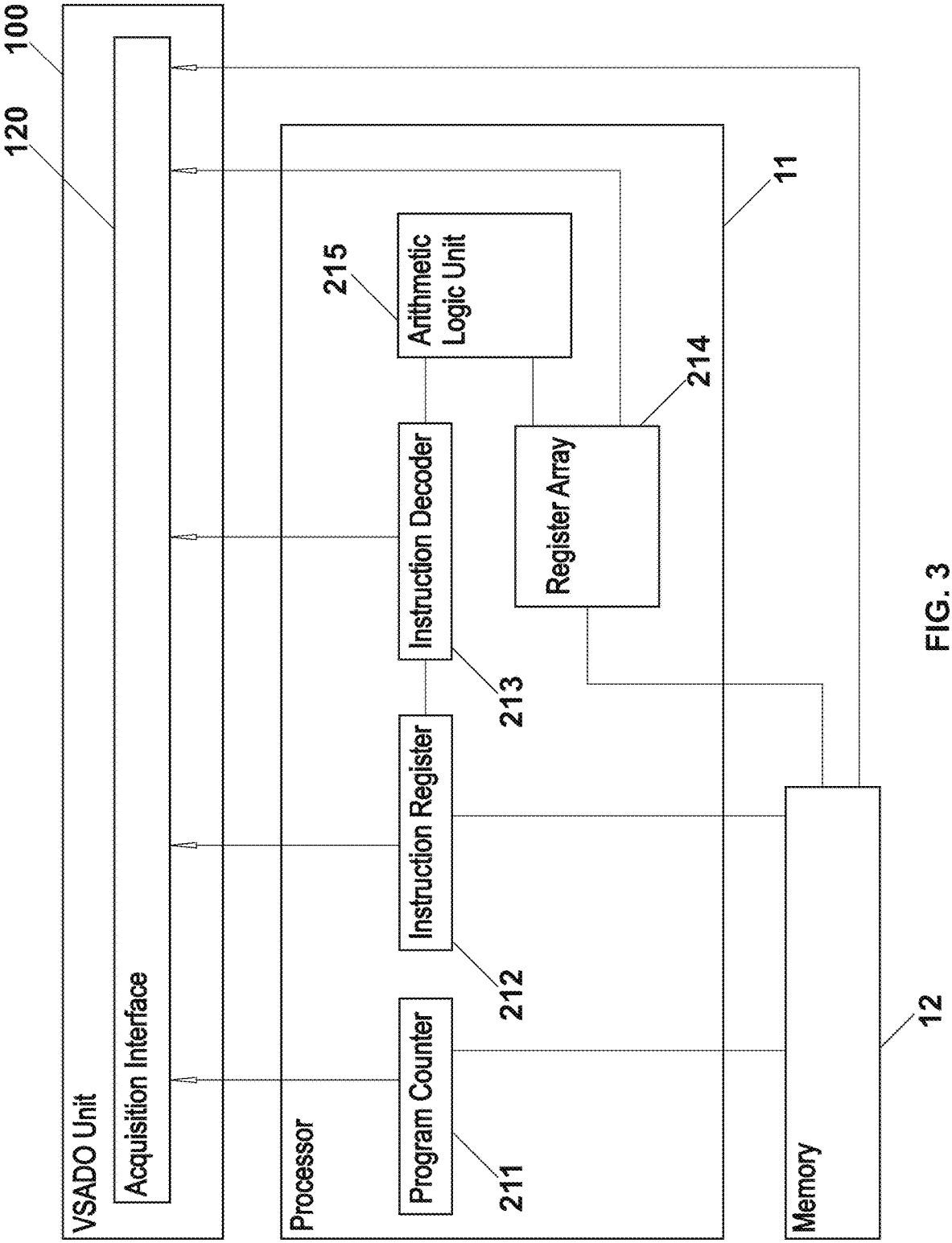

100
120
VSADO Unit
Acquisition Interface
Processor
11
215
Arithmetic Logic Unit
214
Register Array
Instruction Decoder
213
Instruction Register
212
Program Counter
211
Memory
12

FIG. 3

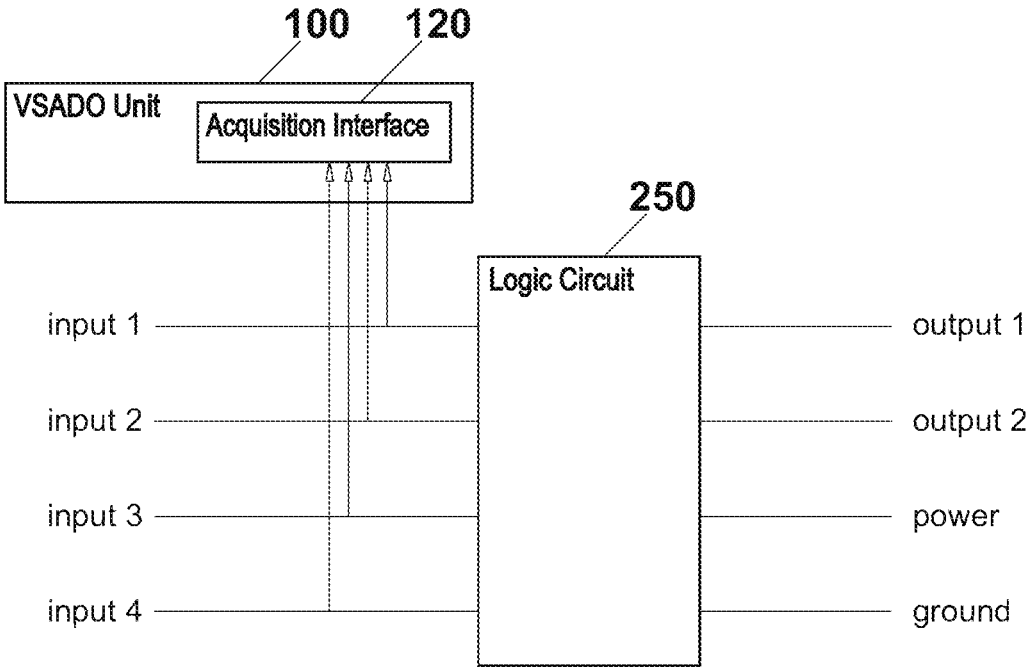

100
120
VSADO Unit
Acquisition Interface
250
Logic Circuit
input 1
input 2
input 3
input 4
output 1
output 2
power
ground

FIG. 4A

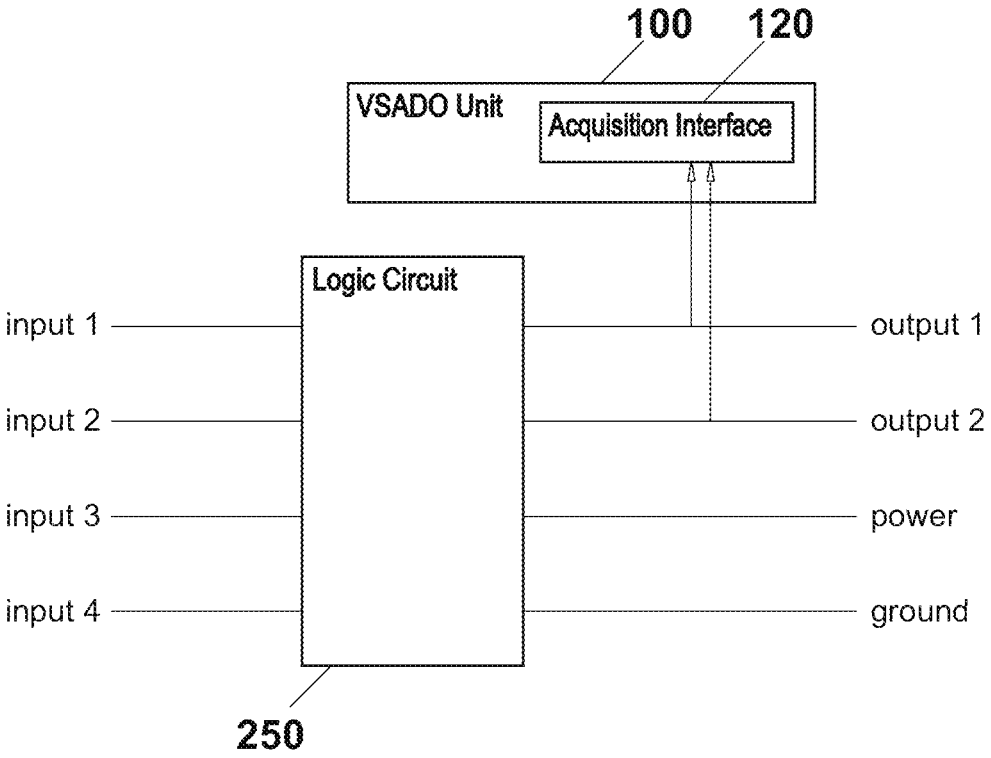

100
120
VSADO Unit
Acquisition Interface
Logic Circuit
input 1
input 2
input 3
input 4
output 1
output 2
power
ground
250

FIG. 4B

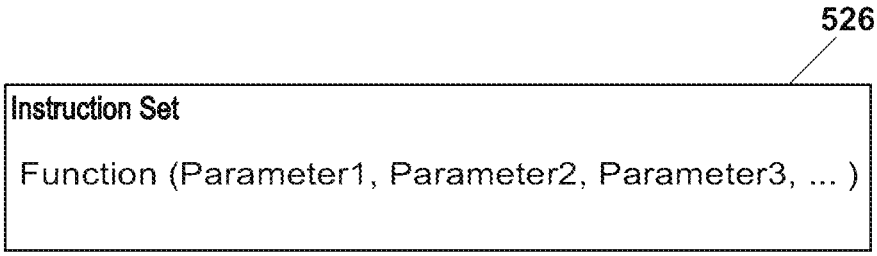


FIG. 5A

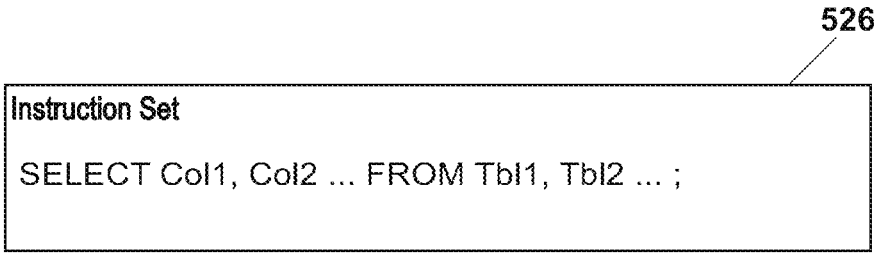


FIG. 5B

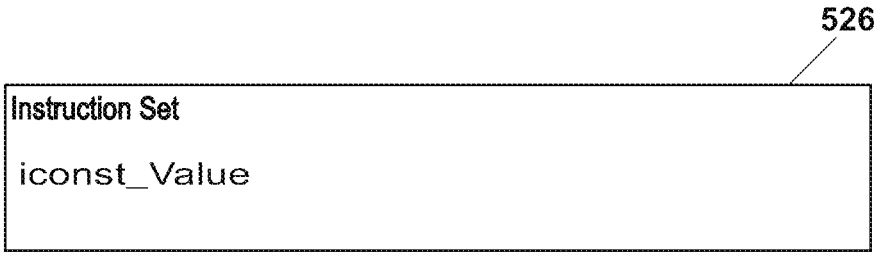


FIG. 5C

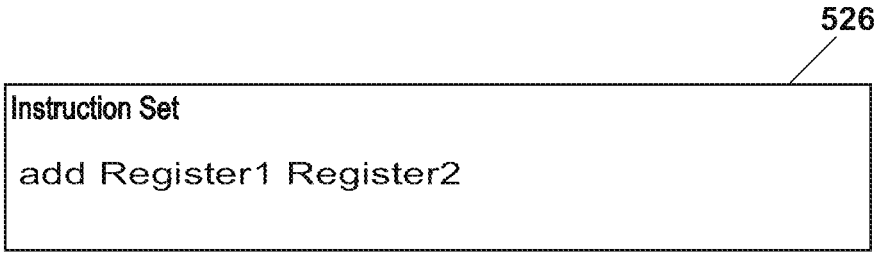


FIG. 5D

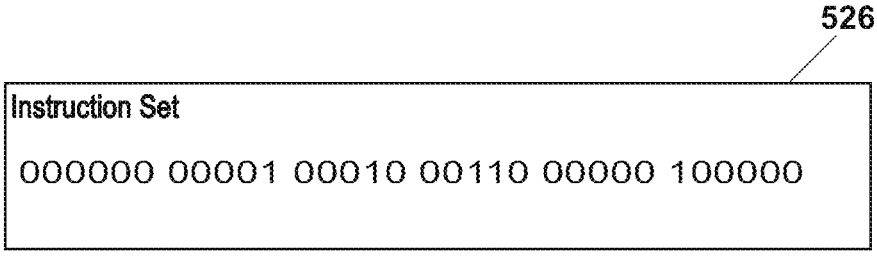


FIG. 5E

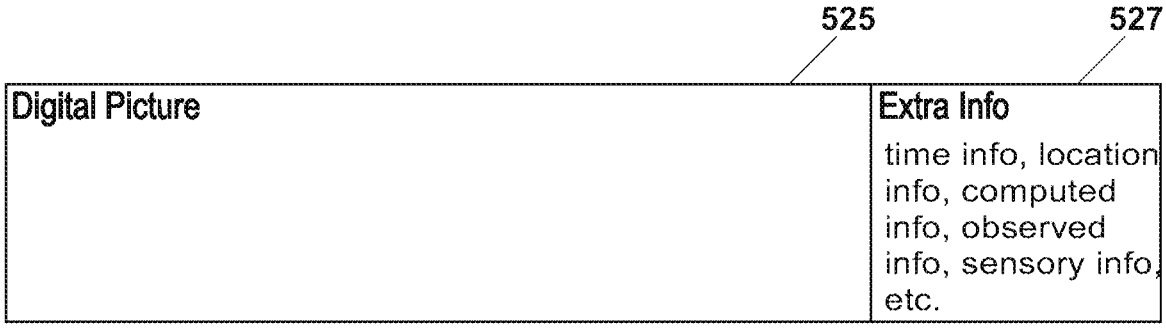

525
527
Digital Picture
Extra Info
time info, location info, computed info, observed info, sensory info, etc.

FIG. 6A

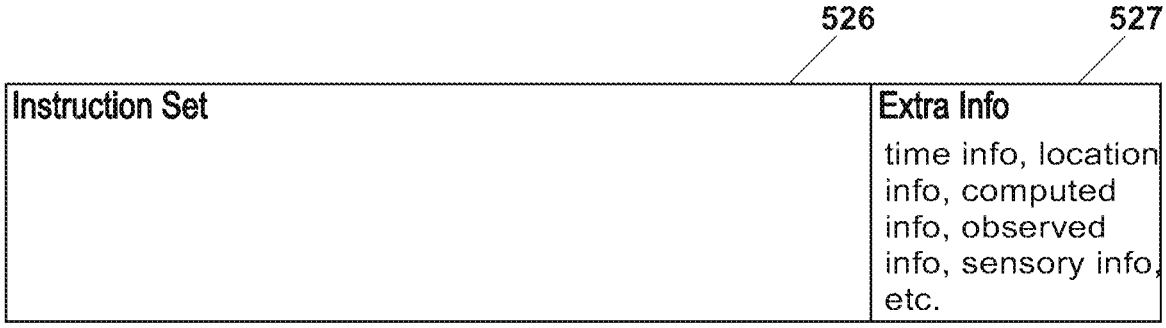

526
527
Instruction Set
Extra Info
time info, location info, computed info, observed info, sensory info, etc.

FIG. 6B

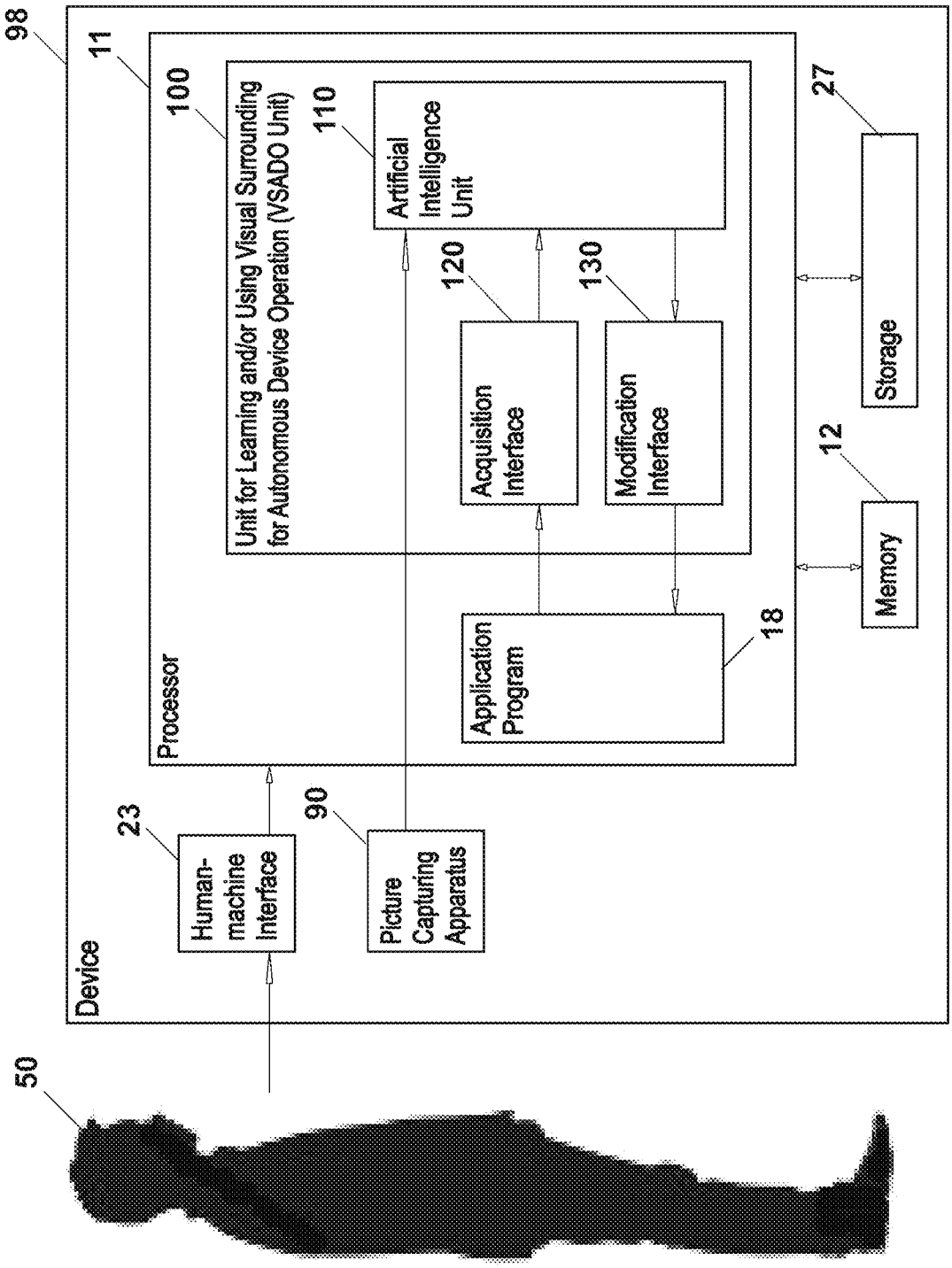

98
11
Device
Processor
100
Unit for Learning and/or Using Visual Surrounding for Autonomous Device Operation (VSADO Unit)
110
Artificial Intelligence Unit
120
Acquisition Interface
130
Modification Interface
18
Application Program
27
Storage
12
Memory
23
Human-machine Interface
90
Picture Capturing Apparatus
50

FIG. 7

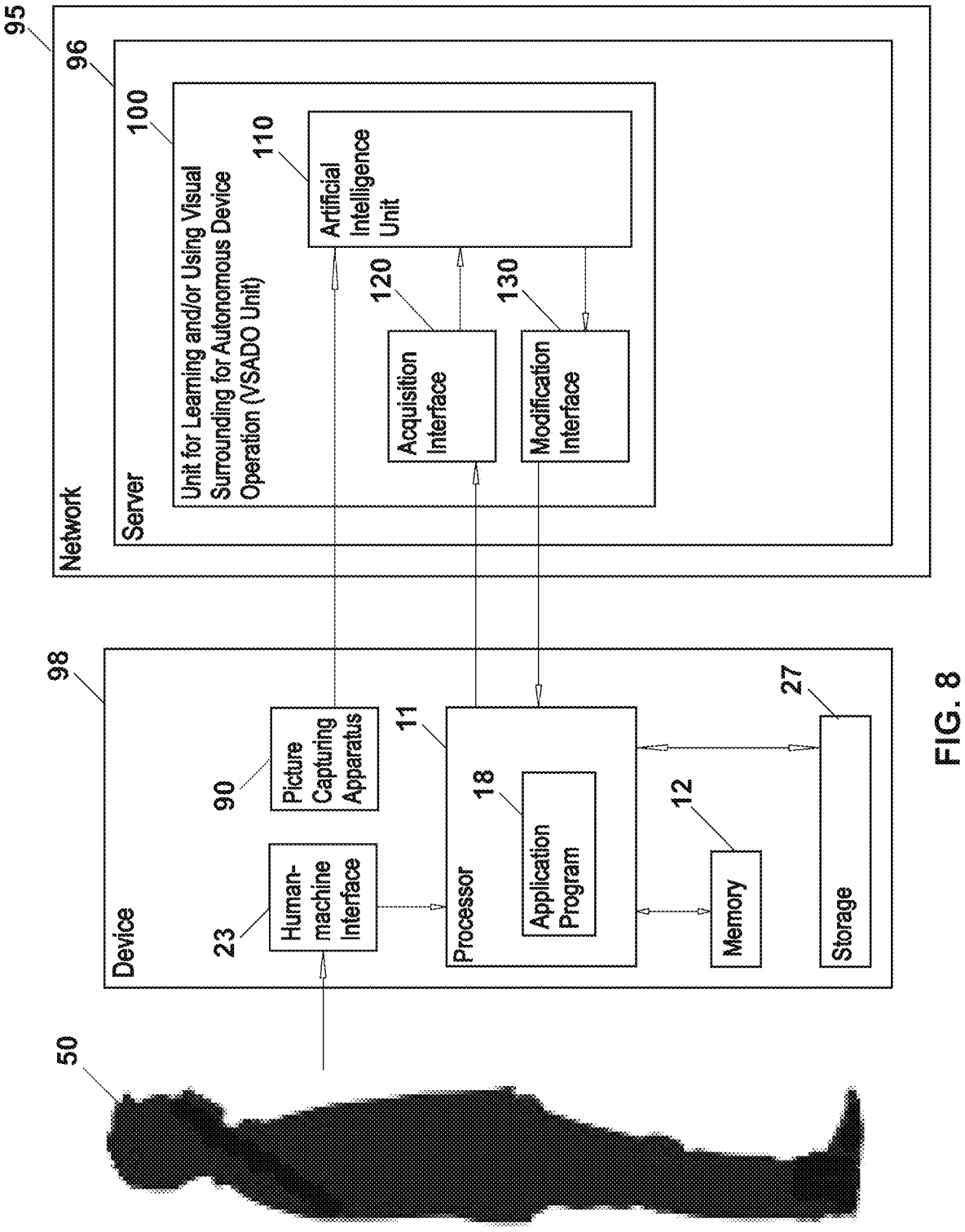

95
Network
96
Server
100
Unit for Learning and/or Using Visual Surrounding for Autonomous Device Operation (VSADO Unit)
110
Artificial Intelligence Unit
120
Acquisition Interface
130
Modification Interface
98
Device
90
Picture Capturing Apparatus
23
Human-machine Interface
11
Processor
18
Application Program
12
Memory
27
Storage
50

FIG. 8

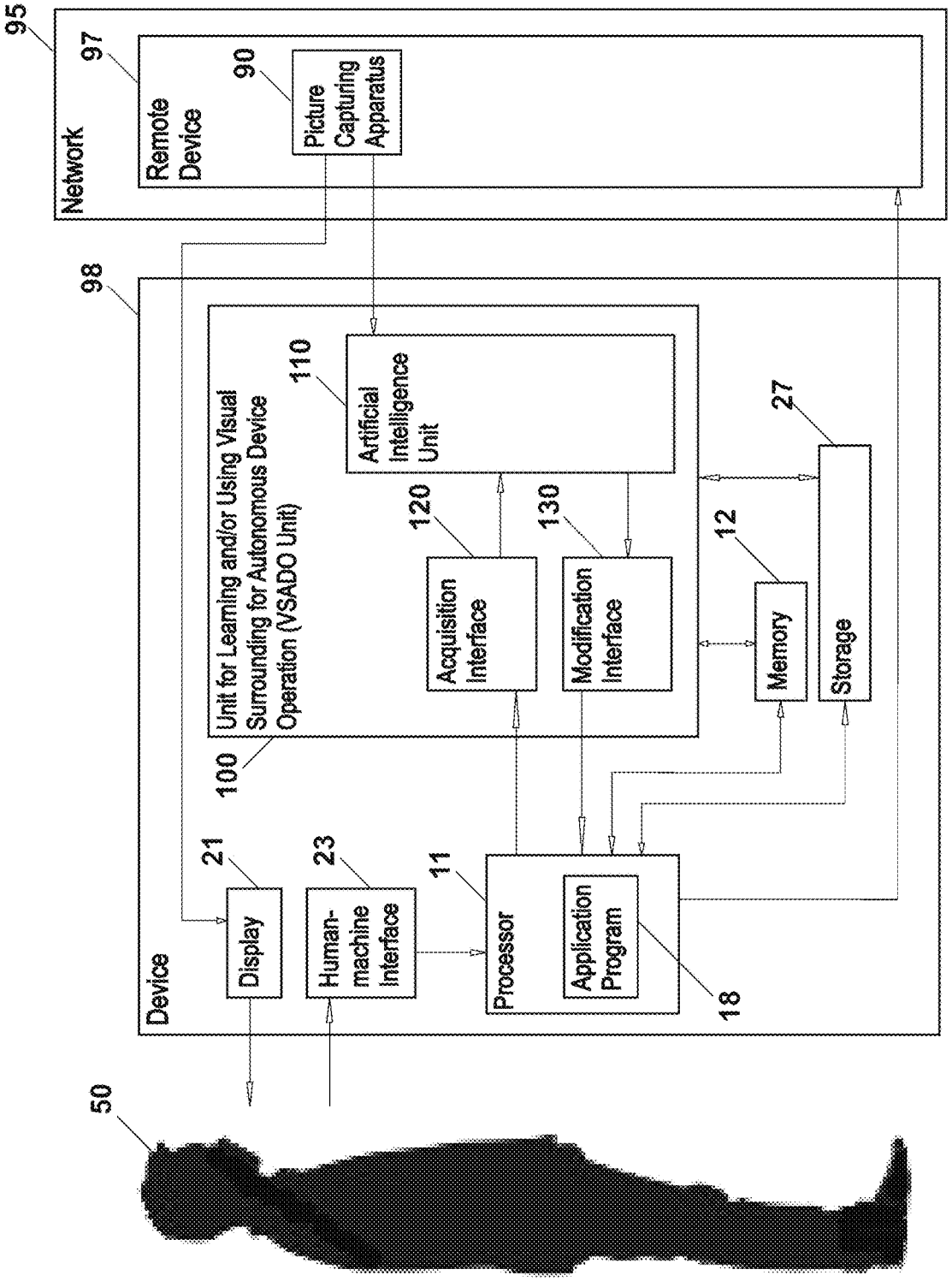

95
Network
97
Remote Device
90
Picture Capturing Apparatus
98
Device
Unit for Learning and/or Using Visual Surrounding for Autonomous Device Operation (VSADO Unit)
100
110
Artificial Intelligence Unit
120
Acquisition Interface
130
Modification Interface
27
Storage
12
Memory
21
Display
23
Human-machine Interface
11
Processor
Application Program
18
50

FIG. 9

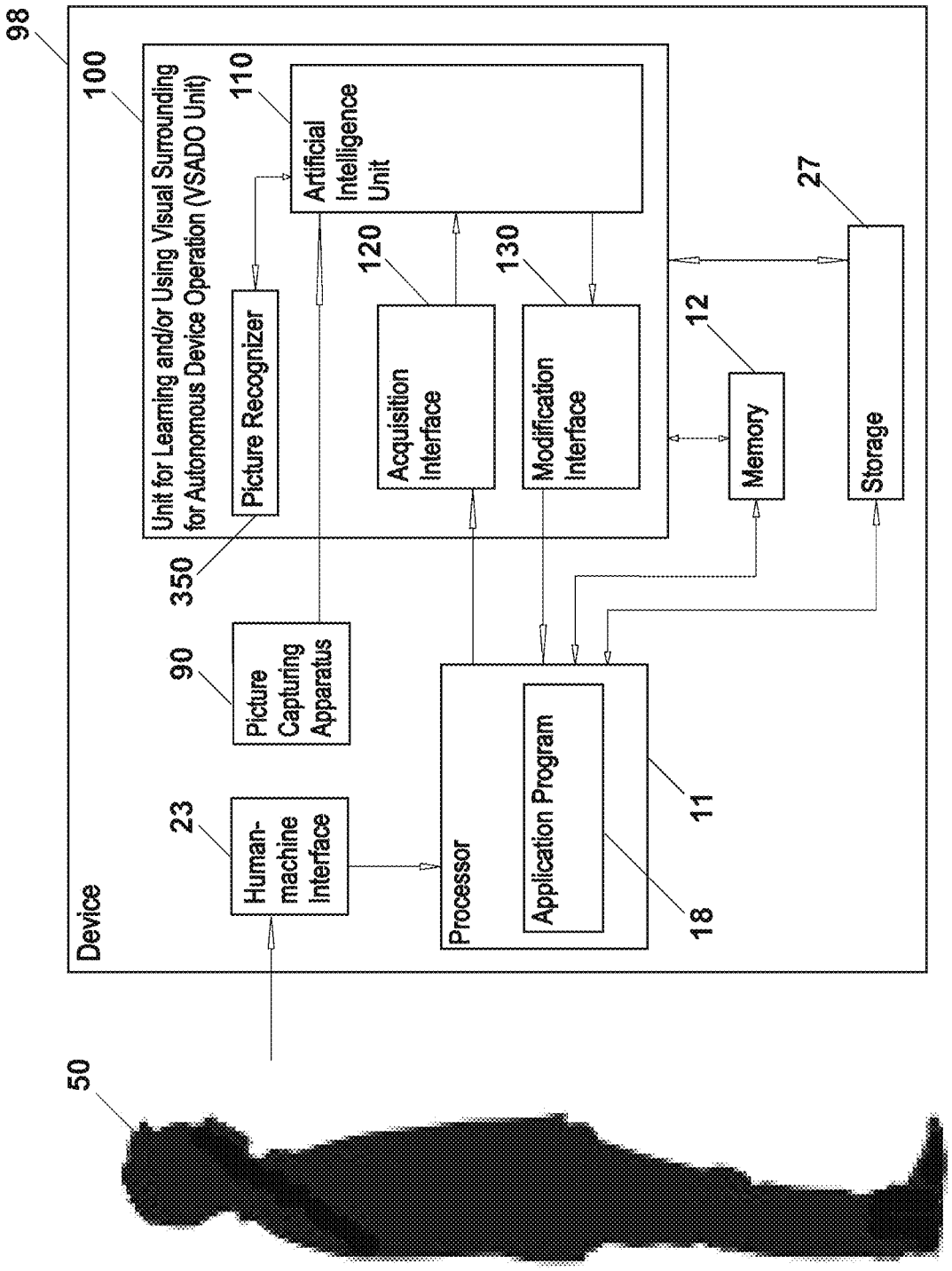

98
Device
100
Unit for Learning and/or Using Visual Surrounding for Autonomous Device Operation (VSADO Unit)
110
Artificial Intelligence Unit
120
Acquisition Interface
130
Modification Interface
350
Picture Recognizer
90
Picture Capturing Apparatus
23
Human-machine Interface
Processor
Application Program
11
18
12
Memory
27
Storage
50

FIG. 10

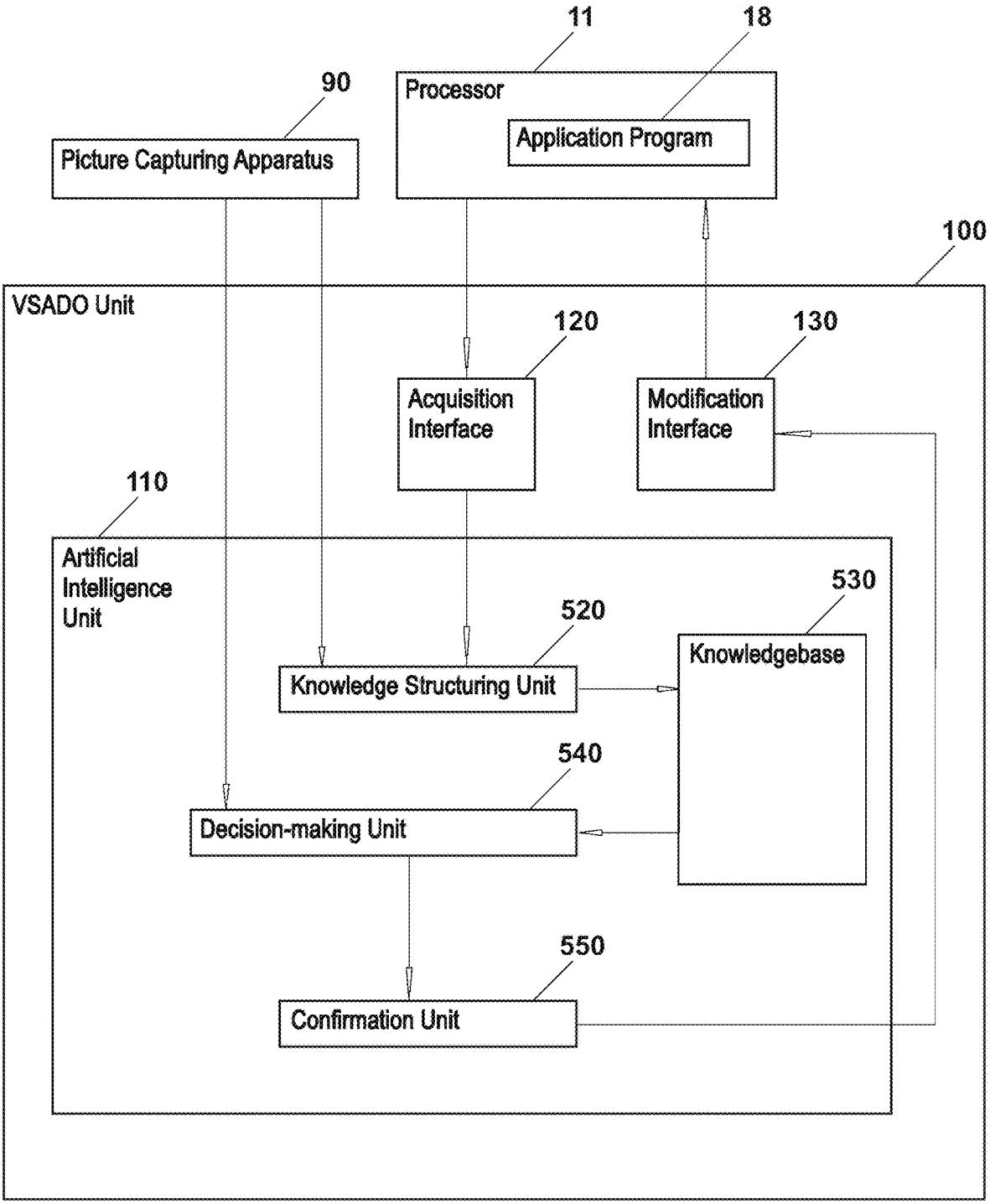

11
18
90
Processor
Application Program
Picture Capturing Apparatus
100
VSADO Unit
120
130
Acquisition Interface
Modification Interface
110
Artificial Intelligence Unit
530
520
Knowledgebase
Knowledge Structuring Unit
540
Decision-making Unit
550
Confirmation Unit

FIG. 11

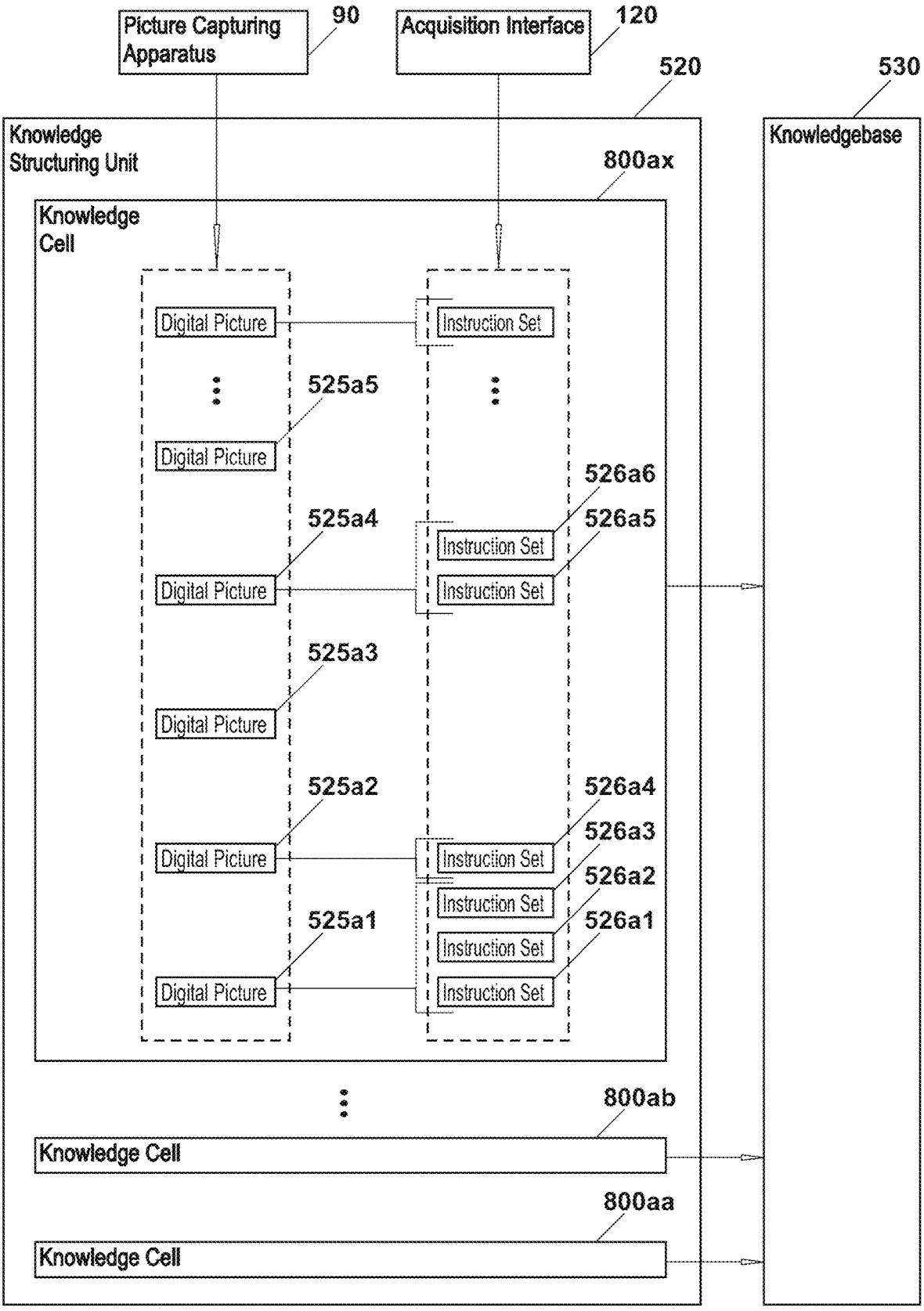

Picture Capturing Apparatus
90
Acquisition Interface
120
520
530
Knowledge Structuring Unit
800ax
Knowledgebase
Knowledge Cell
Digital Picture
Instruction Set
525a5
526a6
525a4
526a5
525a3
525a2
526a4
526a3
526a2
525a1
526a1
800ab
Knowledge Cell
800aa
Knowledge Cell

FIG. 12

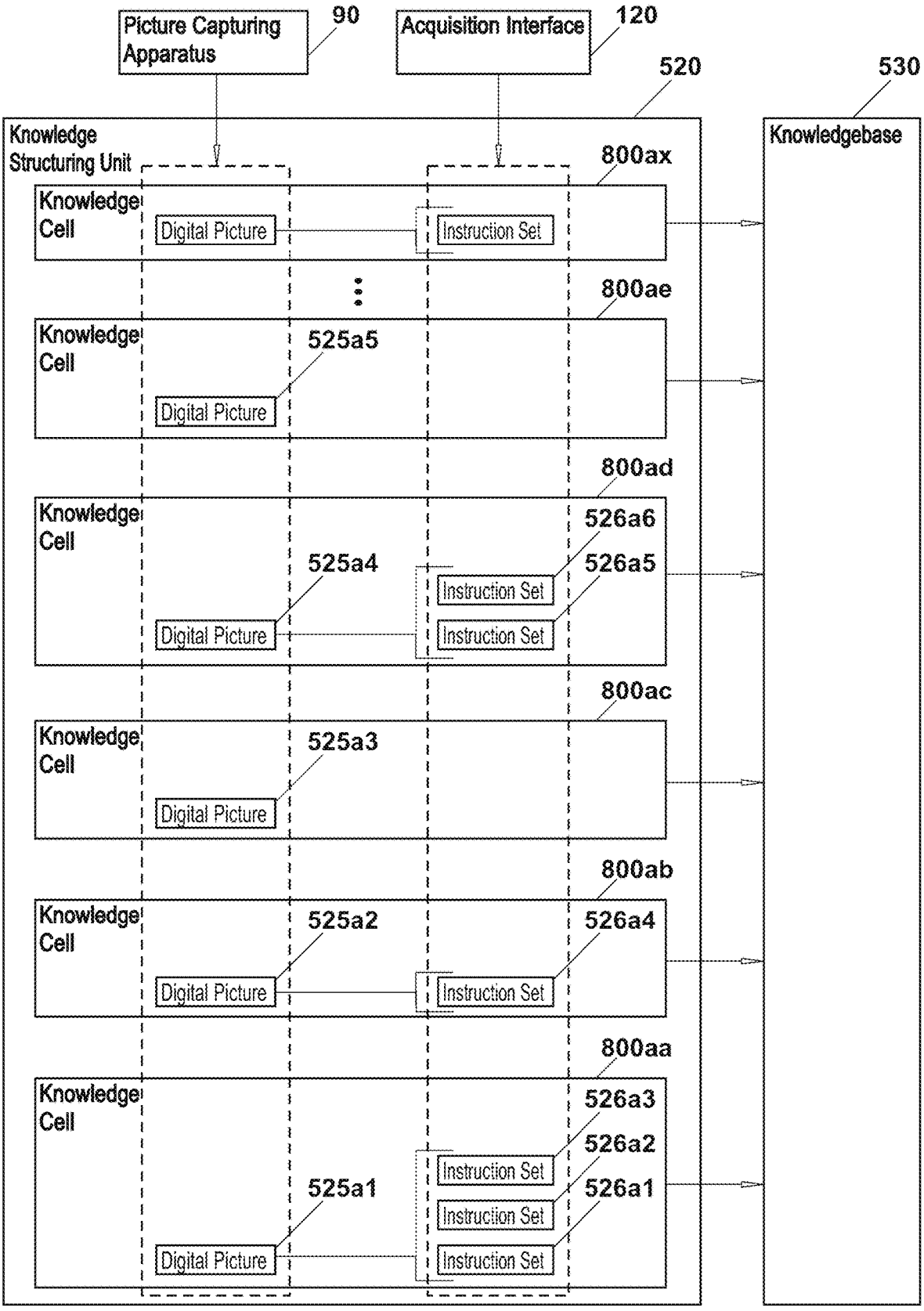

Picture Capturing Apparatus
90
Acquisition Interface
120
520
530
Knowledge Structuring Unit
Knowledgebase
800ax
Knowledge Cell
Digital Picture
Instruction Set
800ae
525a5
526a6
526a5
525a4
800ad
800ac
525a3
800ab
525a2
526a4
800aa
526a3
526a2
526a1
525a1

FIG. 13

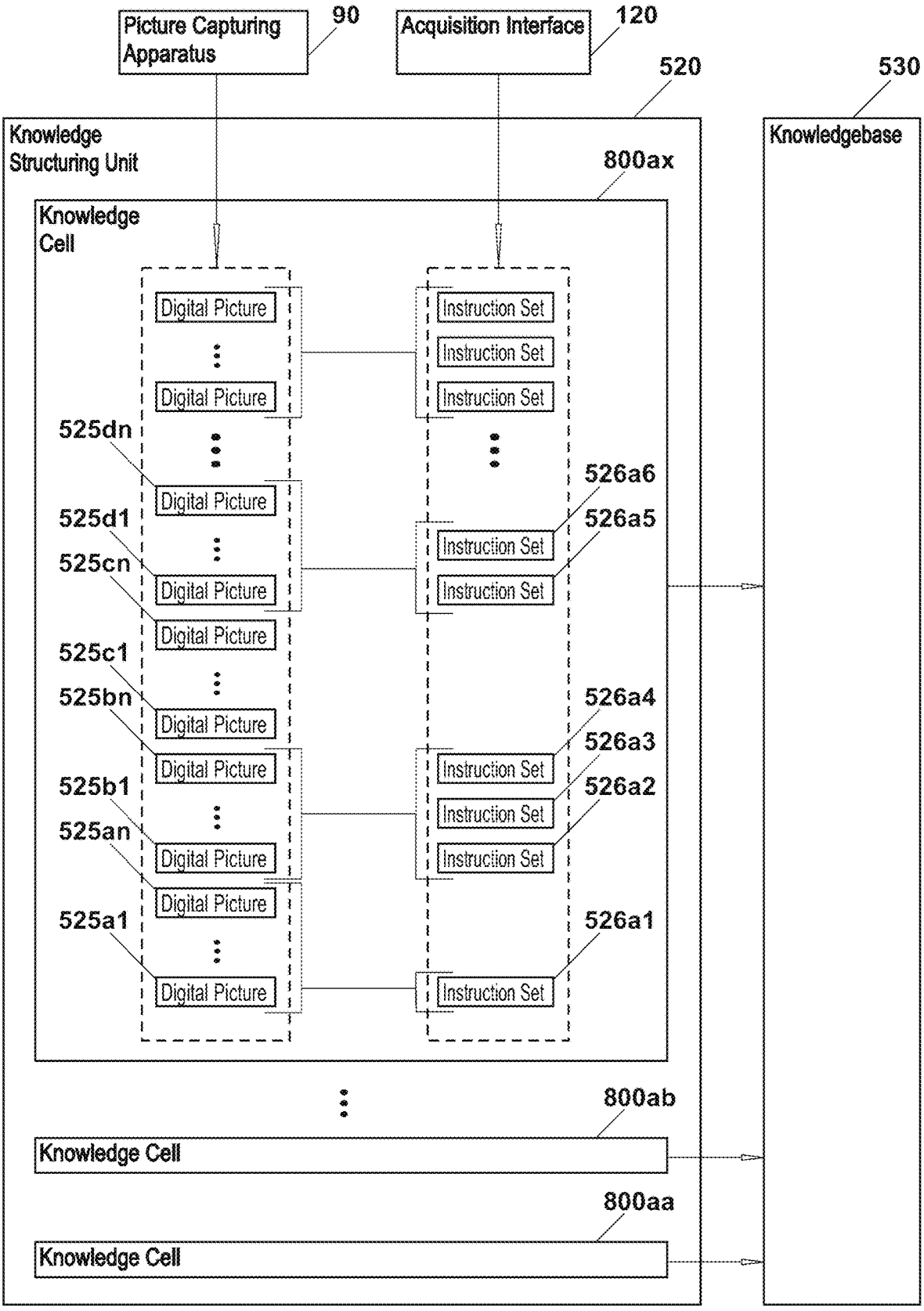

Picture Capturing Apparatus
90
Acquisition Interface
120
520
530
Knowledge Structuring Unit
800ax
Knowledgebase
Knowledge Cell
Digital Picture
Instruction Set
525dn
525d1
525cn
525c1
525bn
525b1
525an
525a1
526a6
526a5
526a4
526a3
526a2
526a1
800ab
Knowledge Cell
800aa
Knowledge Cell

FIG. 14

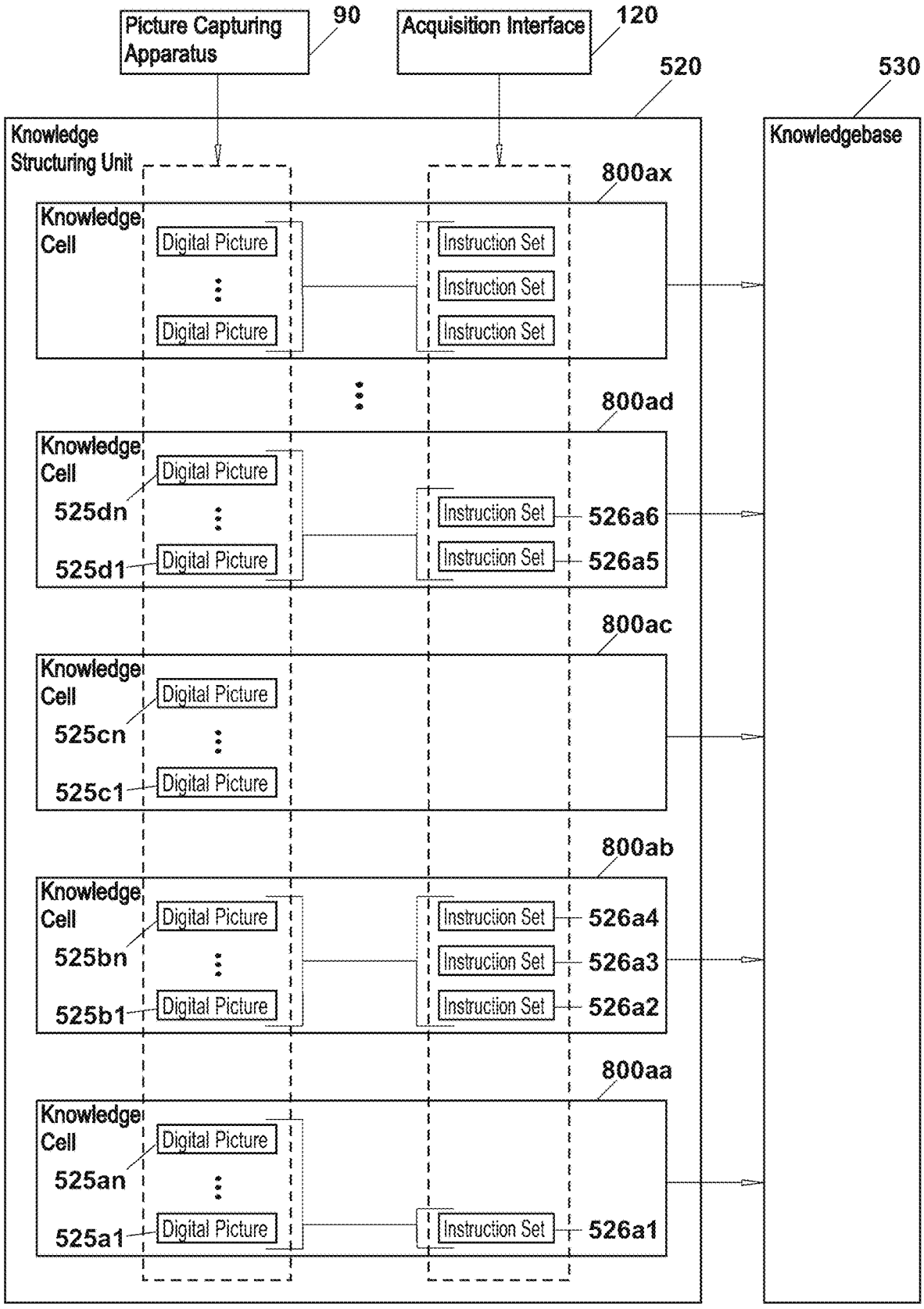
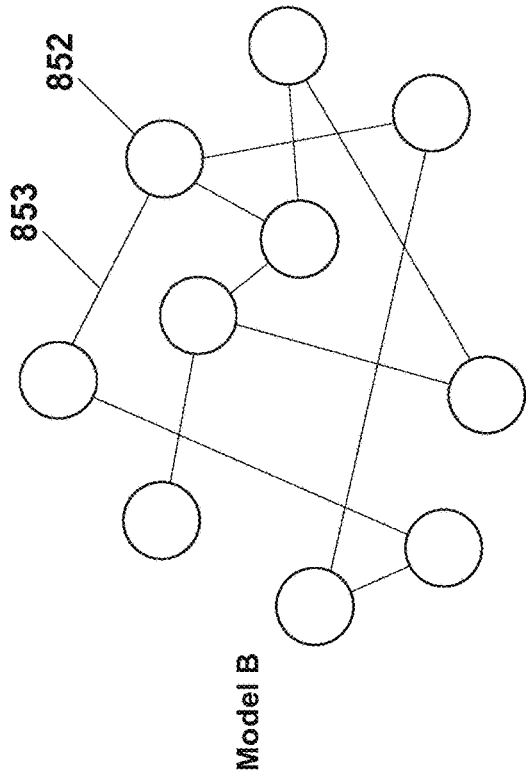
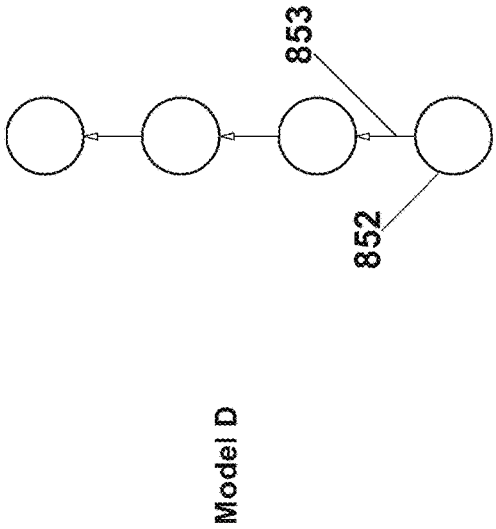
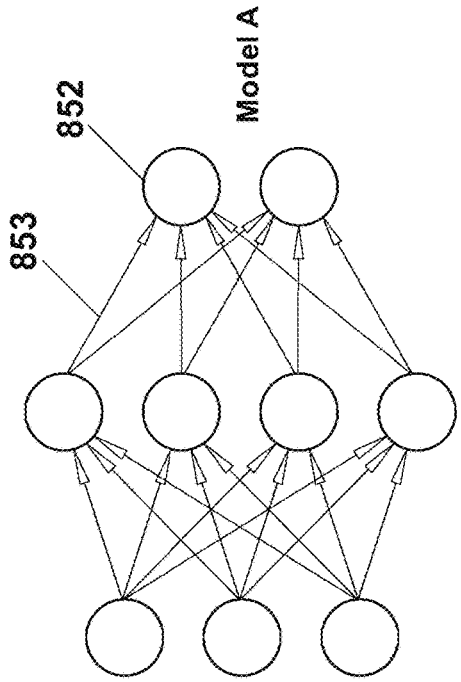

Picture Capturing Apparatus
90
Acquisition Interface
120
520
530
Knowledge Structuring Unit
Knowledgebase
800ax
Knowledge Cell
Digital Picture
Digital Picture
Instruction Set
Instruction Set
Instruction Set
800ad
Knowledge Cell
525dn
525d1
Digital Picture
Digital Picture
Instruction Set
Instruction Set
526a6
526a5
800ac
Knowledge Cell
525cn
525c1
Digital Picture
Digital Picture
800ab
Knowledge Cell
525bn
525b1
Digital Picture
Digital Picture
Instruction Set
Instruction Set
Instruction Set
526a4
526a3
526a2
800aa
Knowledge Cell
525an
525a1
Digital Picture
Digital Picture
Instruction Set
526a1

FIG. 15







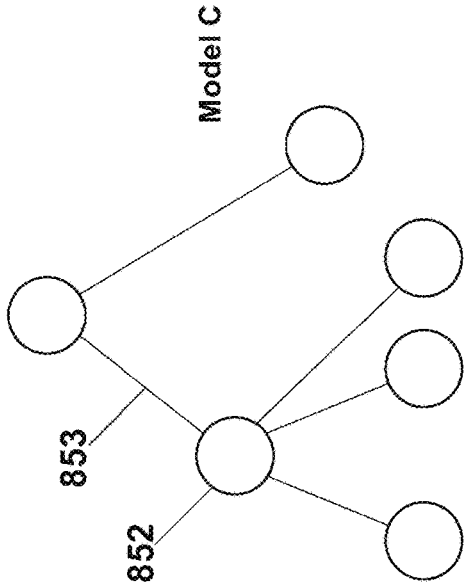


FIG. 16

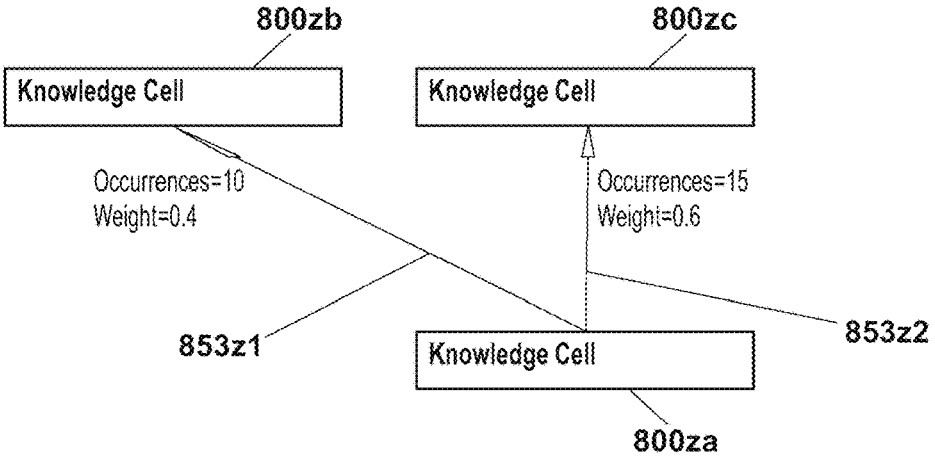


FIG. 17A

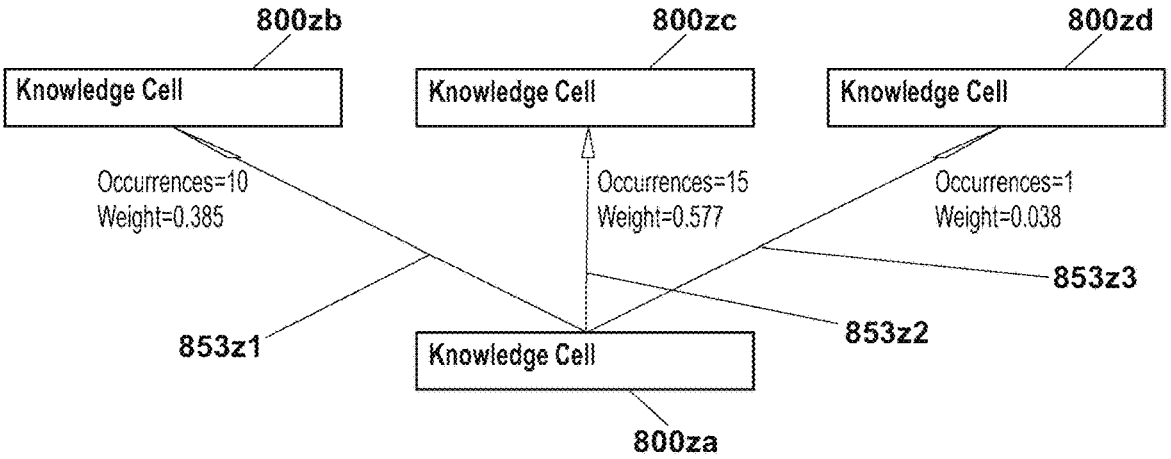


FIG. 17B

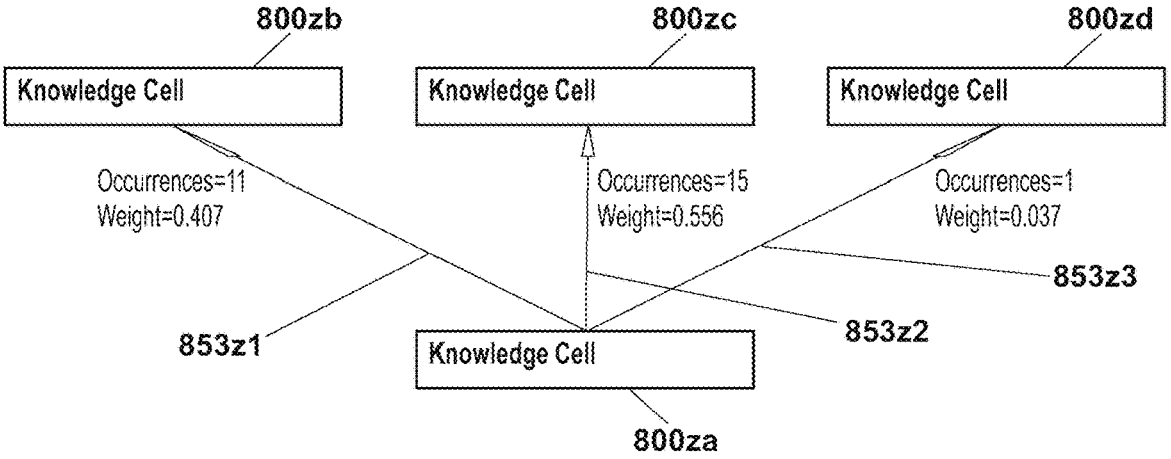


FIG. 17C

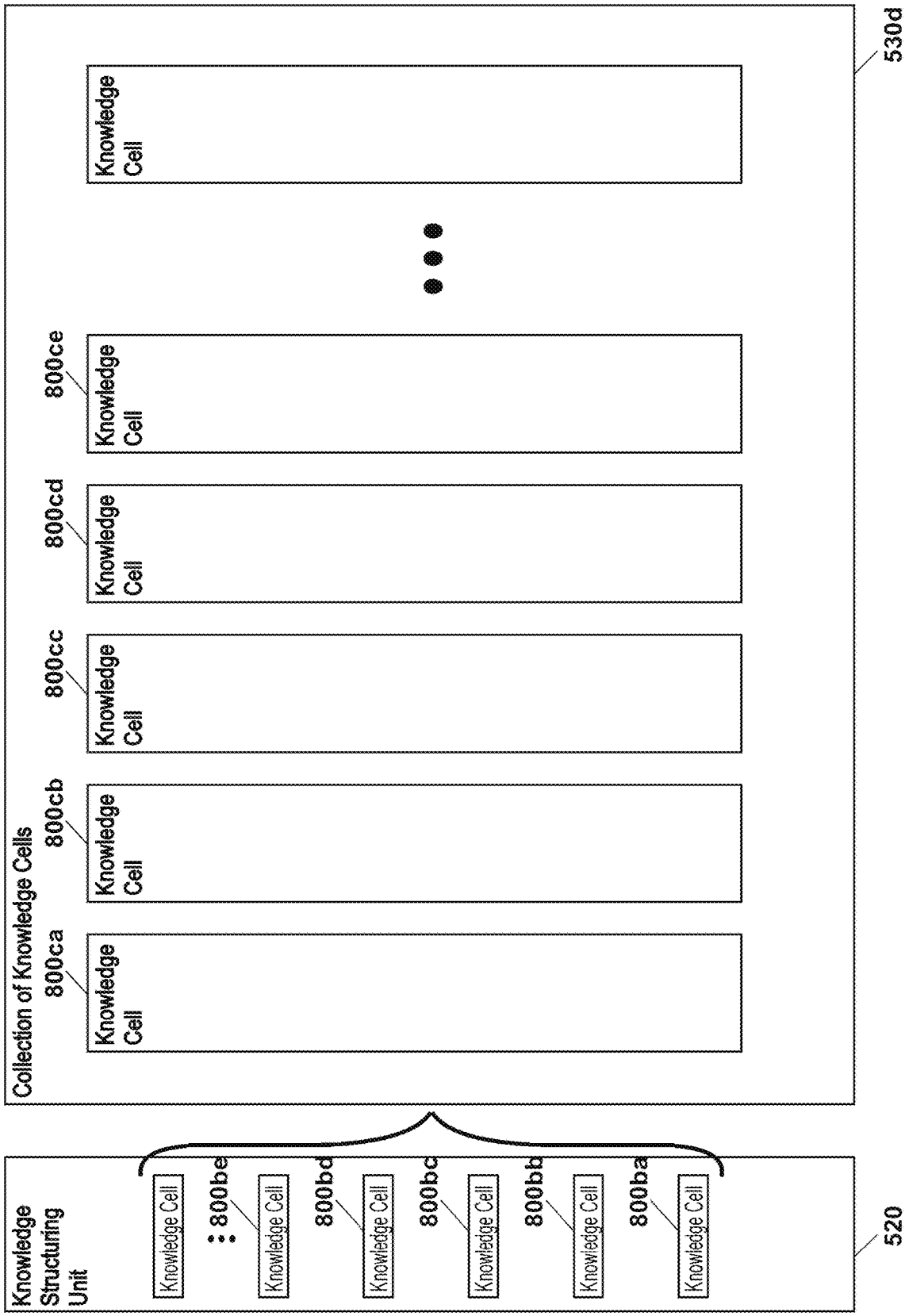

Knowledge Structuring Unit
520
Knowledge Cell
800be
800bd
800bc
800bb
800ba
Collection of Knowledge Cells
530d
800ca
800cb
800cc
800cd
800ce

FIG. 18

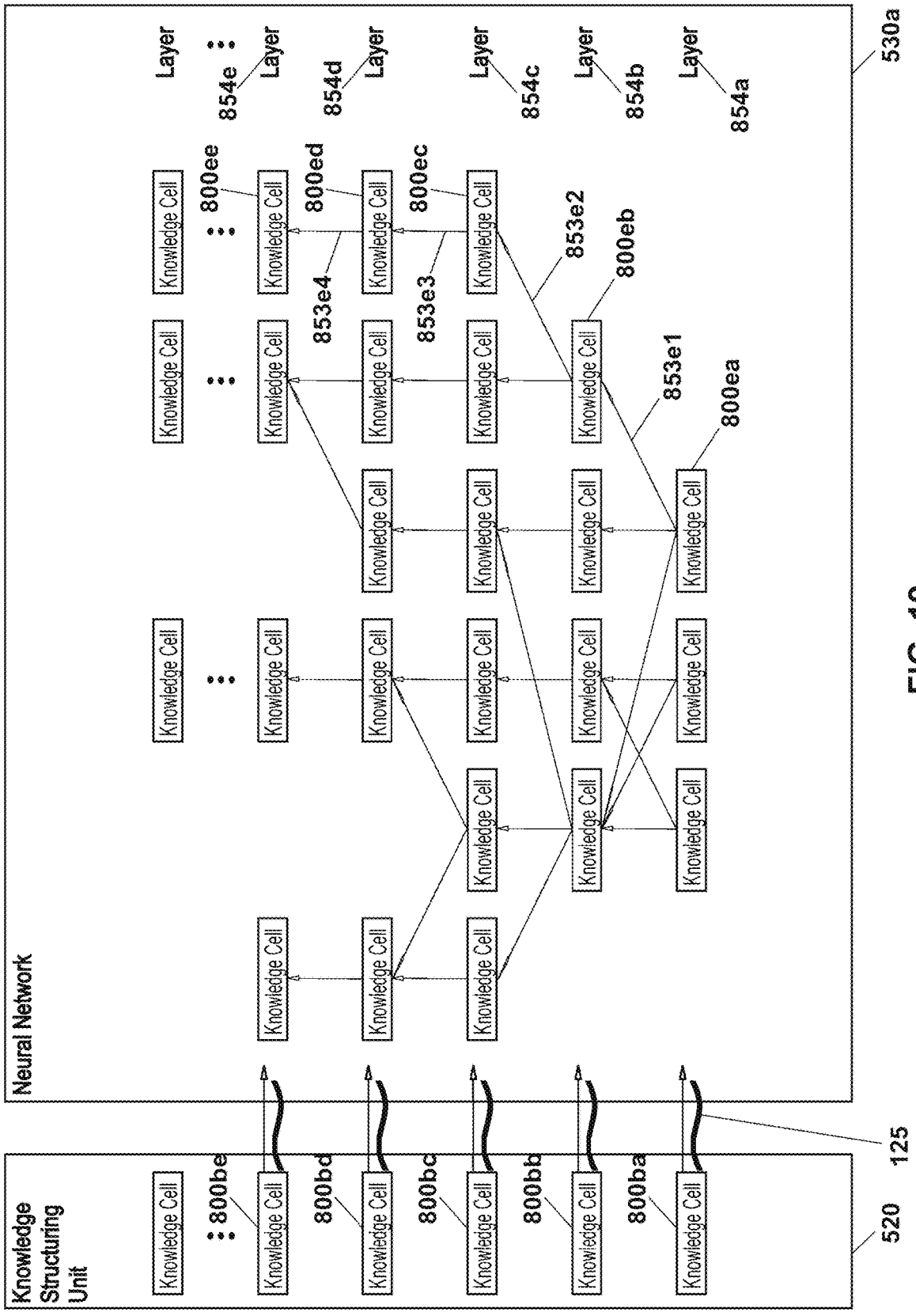

Neural Network
530a
Layer
854e
Layer
854d
Layer
854c
Layer
854b
Layer
854a
Knowledge Cell
800ee
800ed
800ec
853e4
853e3
853e2
800eb
853e1
800ea
Knowledge Structuring Unit
520
125
800be
800bd
800bc
800bb
800ba

FIG. 19

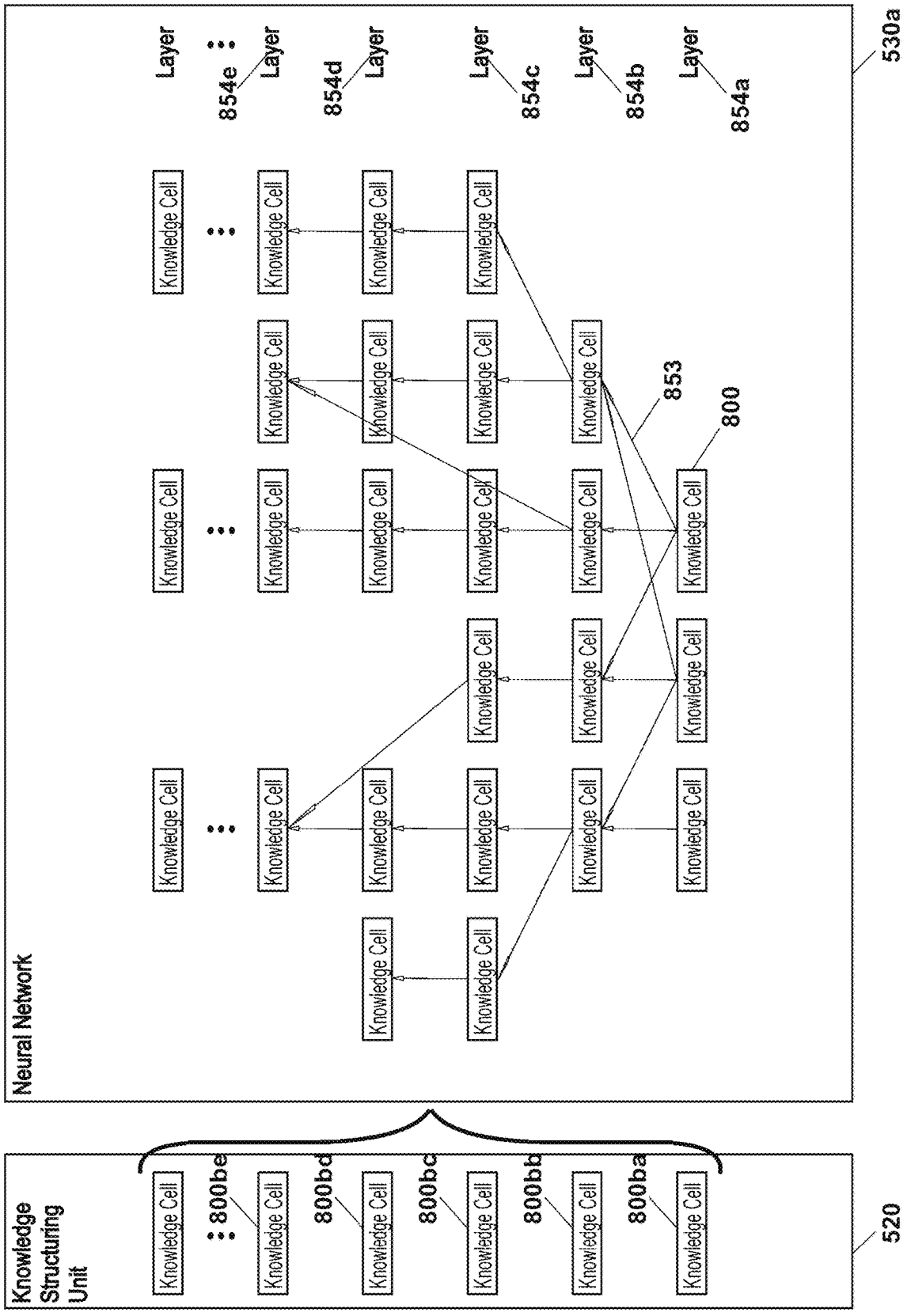

Neural Network
530a
Layer
854e
Layer
854d
Layer
854c
Layer
854b
Layer
854a
Knowledge Cell
853
800
Knowledge Structuring Unit
520
800be
800bd
800bc
800bb
800ba

FIG. 20

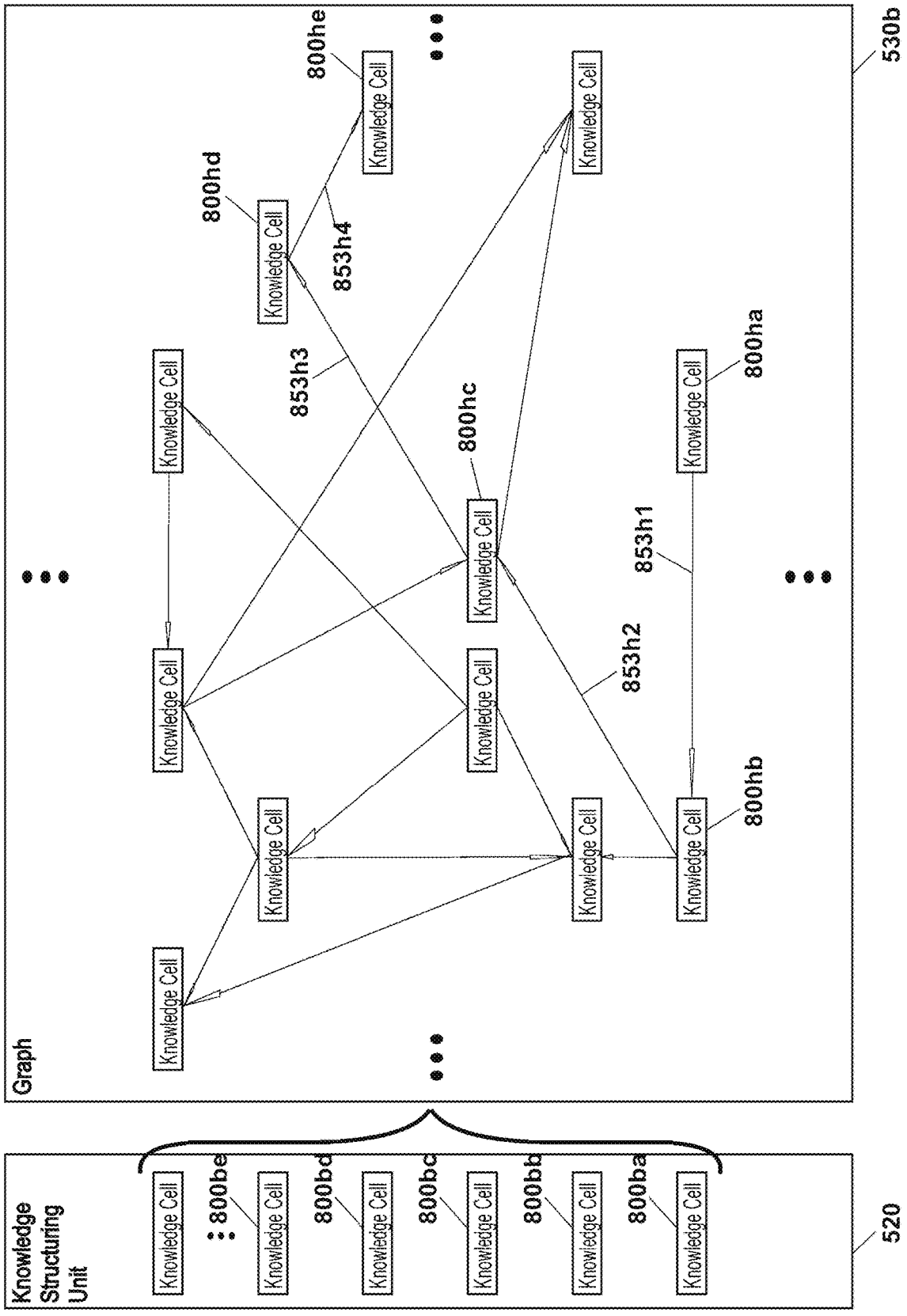

Knowledge Structuring Unit
520
Knowledge Cell
800be
800bd
800bc
800bb
800ba
Graph
530b
800he
800hd
800hc
800ha
800hb
853h4
853h3
853h2
853h1

FIG. 21

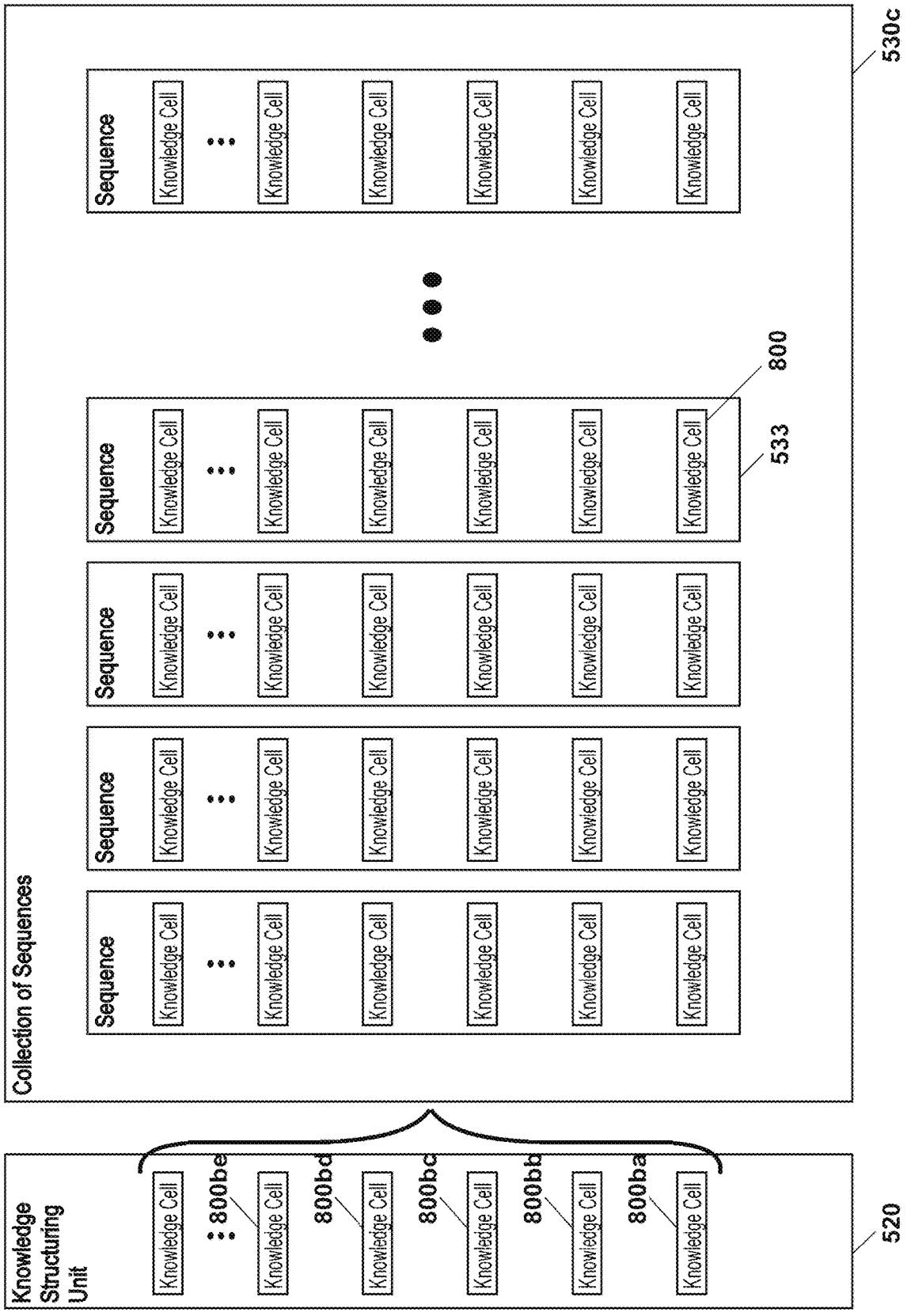

Knowledge Structuring Unit
520
800be
800bd
800bc
800bb
800ba
Knowledge Cell
Collection of Sequences
530c
Sequence
800
533

FIG. 22

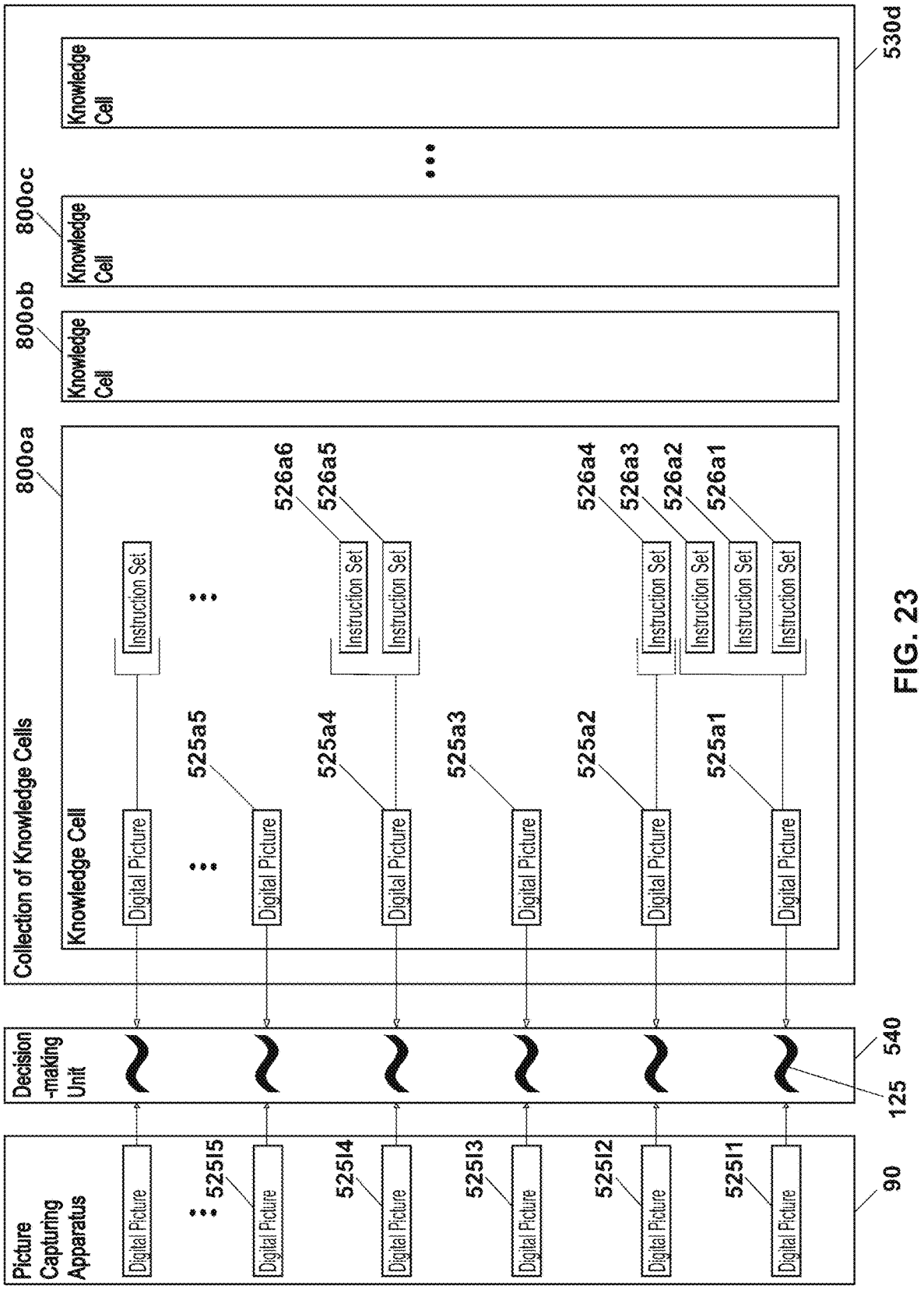

Picture Capturing Apparatus
90
Digital Picture
525I5
525I4
525I3
525I2
525I1
Decision -making Unit
540
125
Collection of Knowledge Cells
800oa
800ob
800oc
530d
Knowledge Cell
Instruction Set
525a5
525a4
525a3
525a2
525a1
526a6
526a5
526a4
526a3
526a2
526a1

FIG. 23

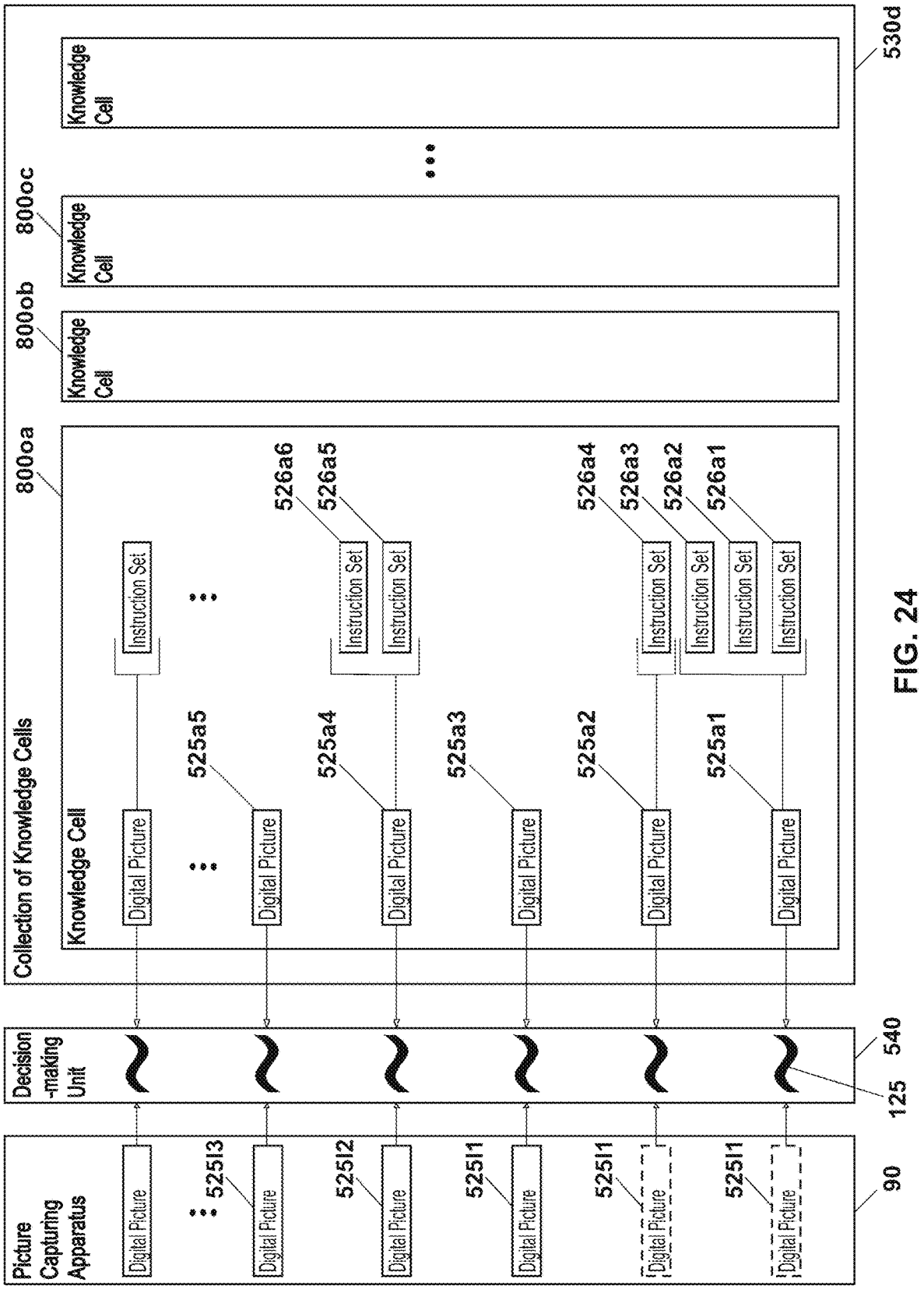

Picture Capturing Apparatus
90
Digital Picture
525l3
525l2
525l1
Decision -making Unit
540
125
Collection of Knowledge Cells
800oa
800ob
800oc
530d
Knowledge Cell
Instruction Set
525a5
525a4
525a3
525a2
525a1
526a6
526a5
526a4
526a3
526a2
526a1

FIG. 24

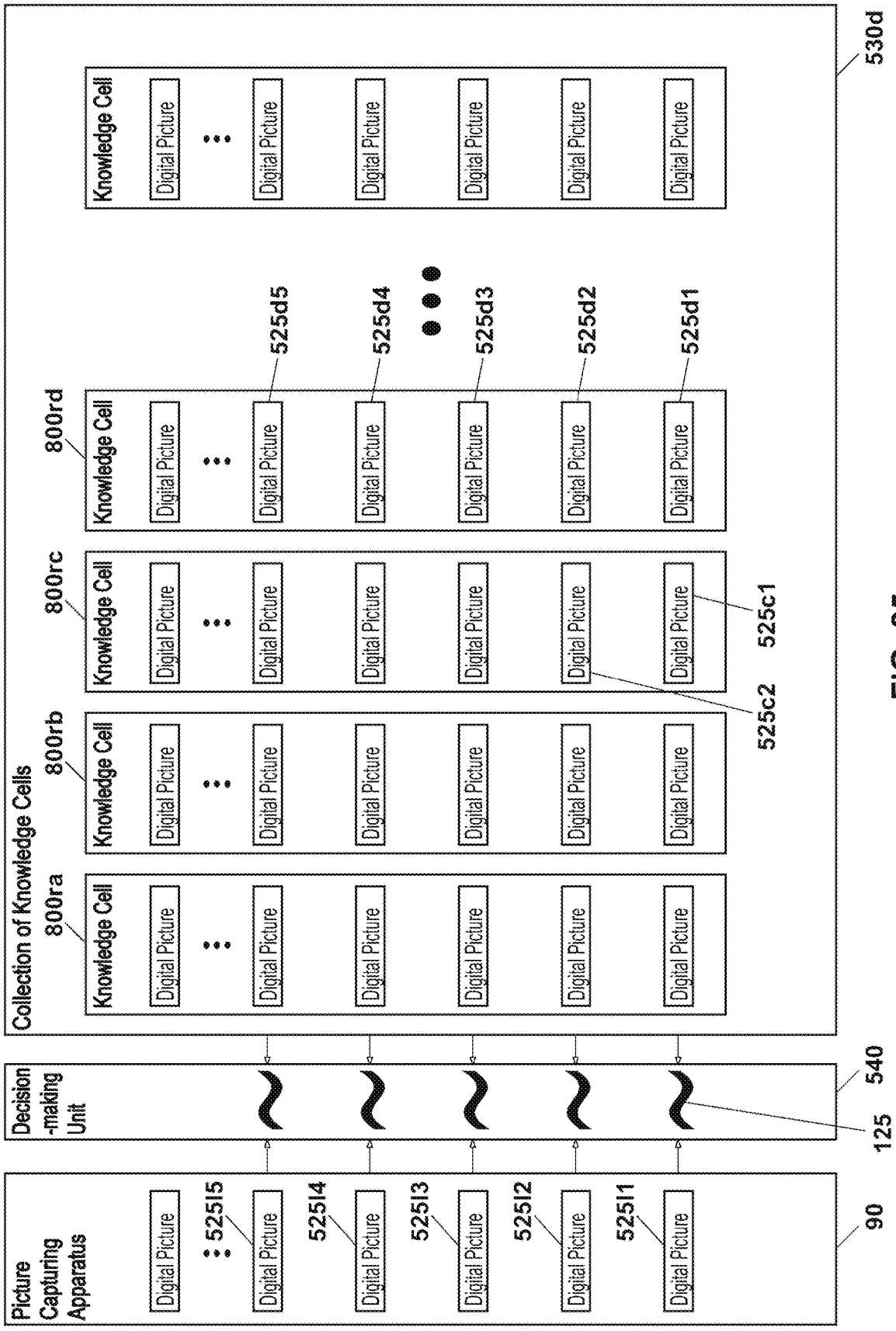

Picture Capturing Apparatus
90
Digital Picture
525I5
525I4
525I3
525I2
525I1
Decision -making Unit
540
125
Collection of Knowledge Cells
530d
Knowledge Cell
800ra
800rb
800rc
800rd
525c1
525c2
525d1
525d2
525d3
525d4
525d5

FIG. 25

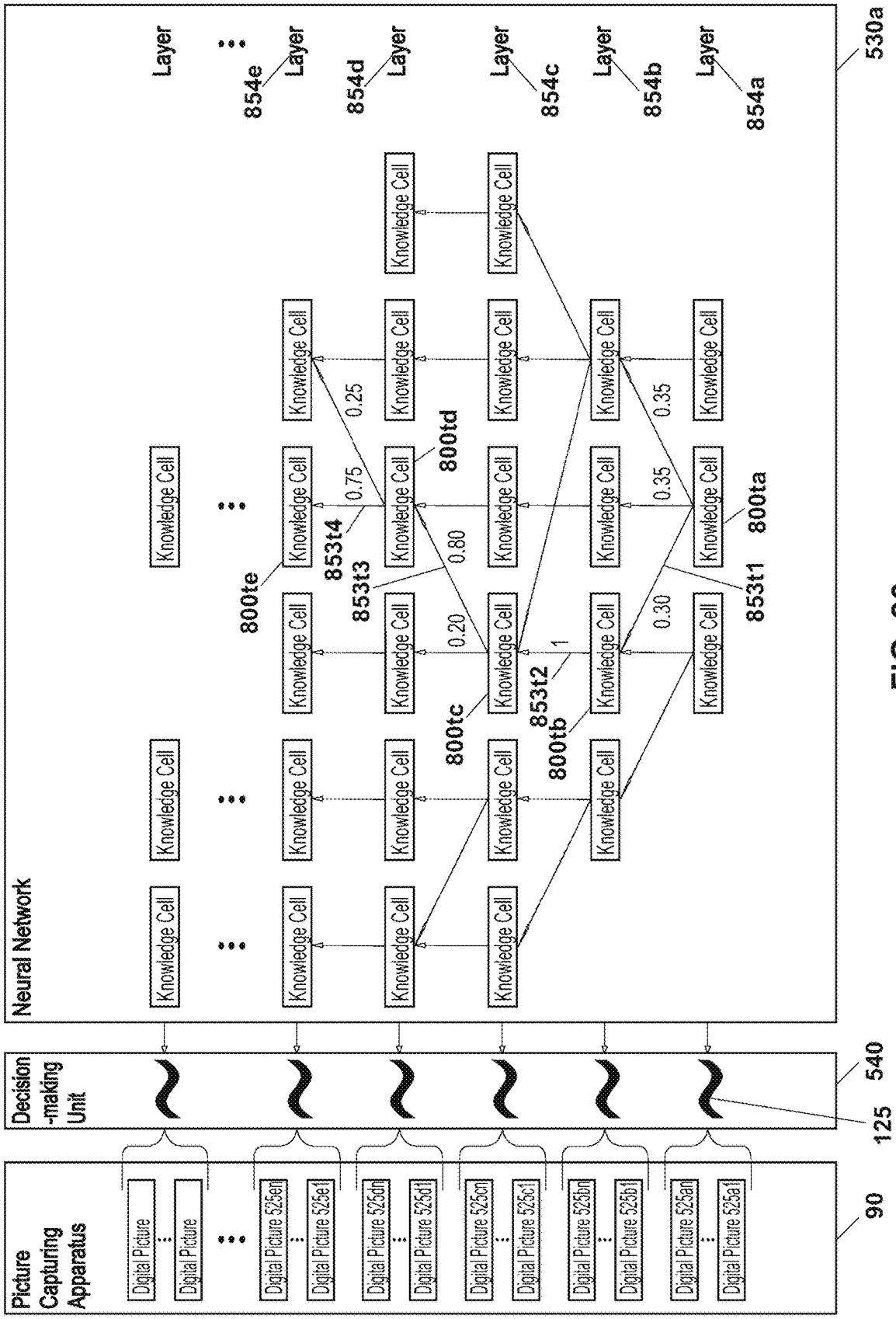

Picture Capturing Apparatus
Digital Picture
Digital Picture 525en
Digital Picture 525e1
Digital Picture 525dn
Digital Picture 525d1
Digital Picture 525cn
Digital Picture 525c1
Digital Picture 525bn
Digital Picture 525b1
Digital Picture 525an
Digital Picture 525a1
90
Decision -making Unit
540
125
Neural Network
Layer
854e
854d
854c
854b
854a
530a
Knowledge Cell
800te
800td
800tc
800tb
800ta
853t4
853t3
853t2
853t1
0.25
0.75
0.80
0.20
1
0.35
0.35
0.30

FIG. 26

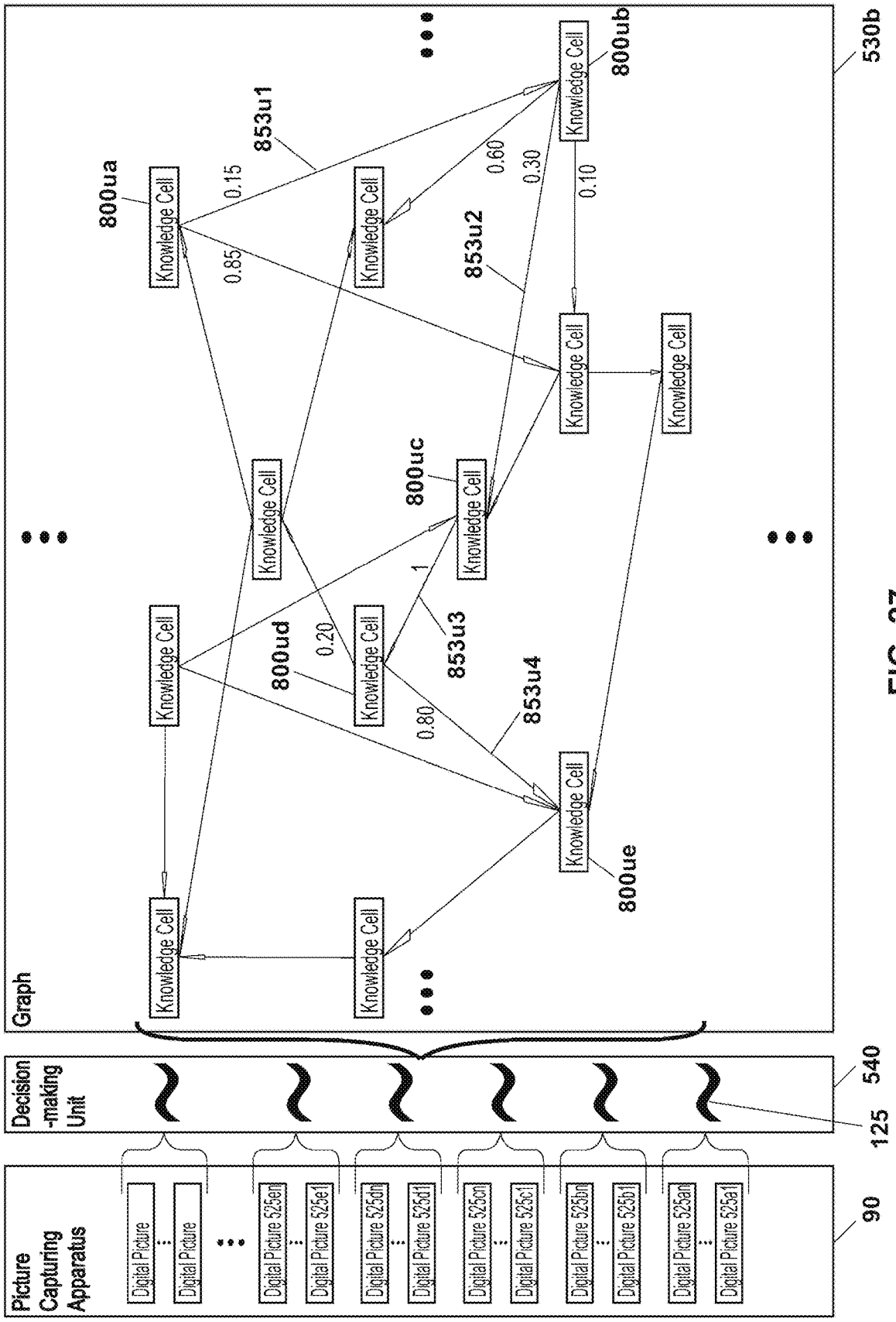

Picture Capturing Apparatus
Digital Picture
Digital Picture 525en
Digital Picture 525e1
Digital Picture 525dn
Digital Picture 525d1
Digital Picture 525cn
Digital Picture 525c1
Digital Picture 525bn
Digital Picture 525b1
Digital Picture 525an
Digital Picture 525a1
90
Decision -making Unit
125
540
Graph
530b
Knowledge Cell
800ua
800ub
800uc
800ud
800ue
853u1
853u2
853u3
853u4
0.15
0.85
0.60
0.30
0.10
0.20
0.80
1

FIG. 27

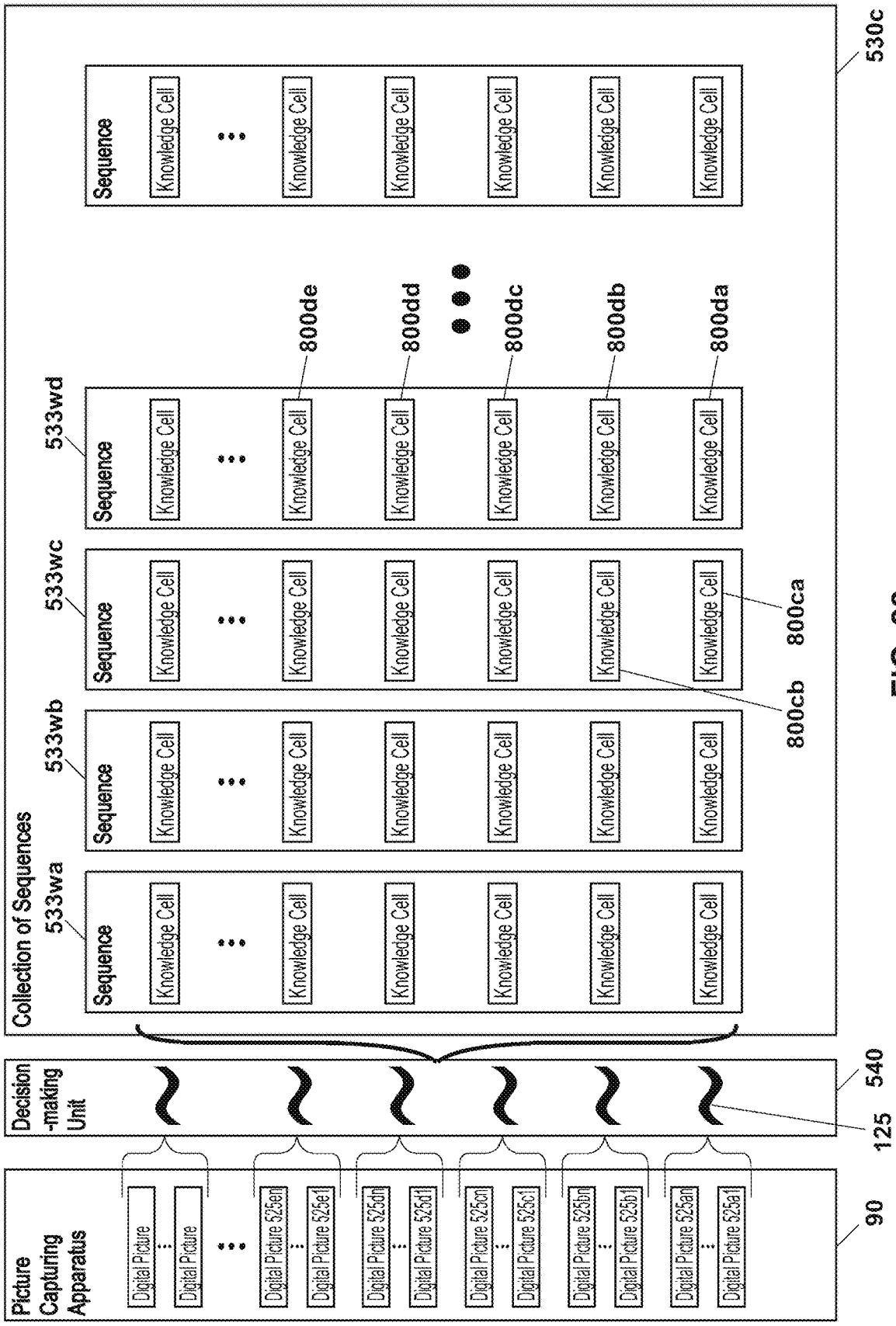

Picture Capturing Apparatus
90
Digital Picture
Digital Picture
Digital Picture 525en
Digital Picture 525e1
Digital Picture 525dn
Digital Picture 525d1
Digital Picture 525cn
Digital Picture 525c1
Digital Picture 525bn
Digital Picture 525b1
Digital Picture 525an
Digital Picture 525a1
Decision -making Unit
125
540
Collection of Sequences
530c
533wa
533wb
533wc
533wd
Sequence
Knowledge Cell
800da
800db
800dc
800dd
800de
800ca
800cb

FIG. 28

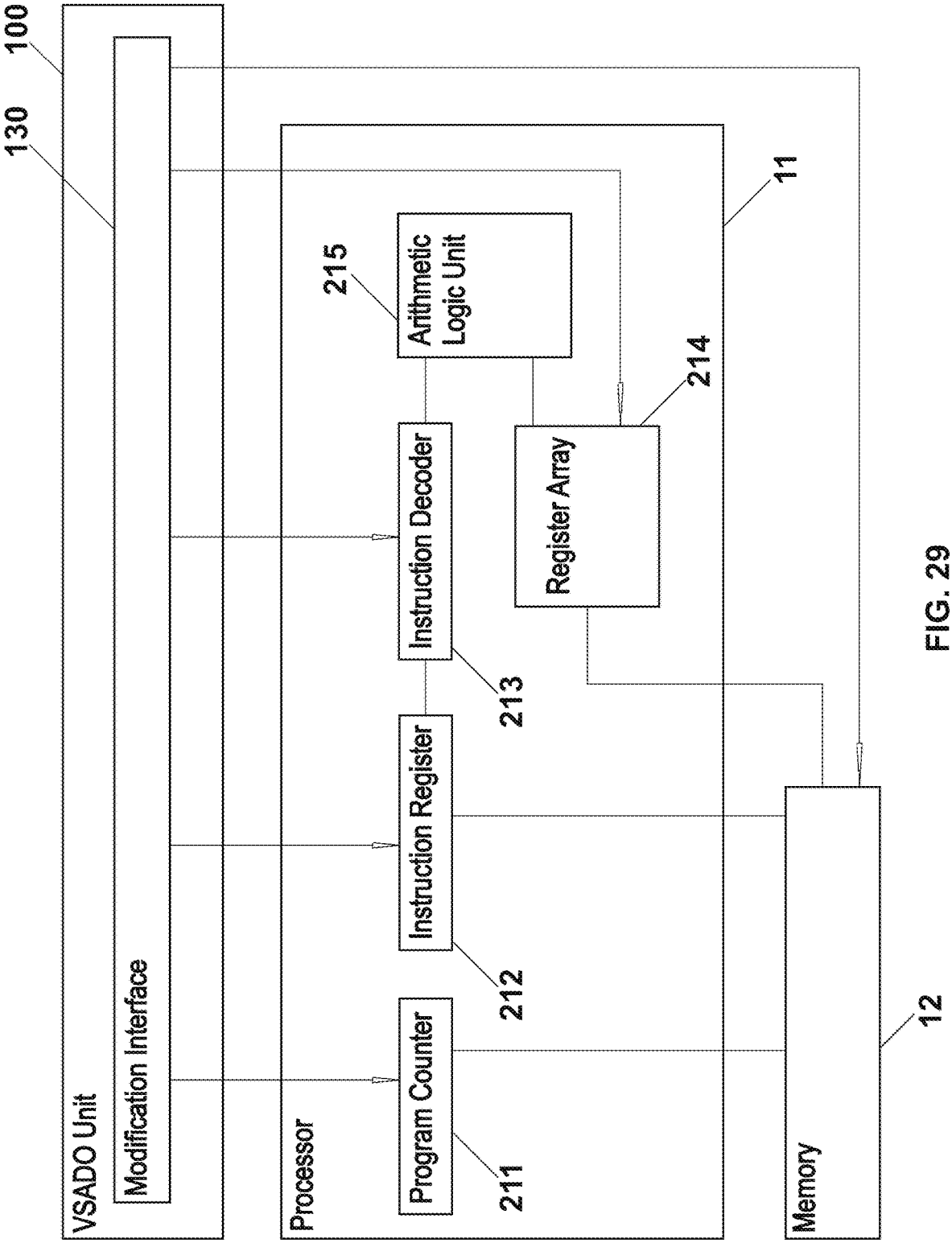

100
130
VSADO Unit
Modification Interface
Processor
11
215
Arithmetic Logic Unit
214
Instruction Decoder
Register Array
213
Instruction Register
212
Program Counter
211
Memory
12

FIG. 29

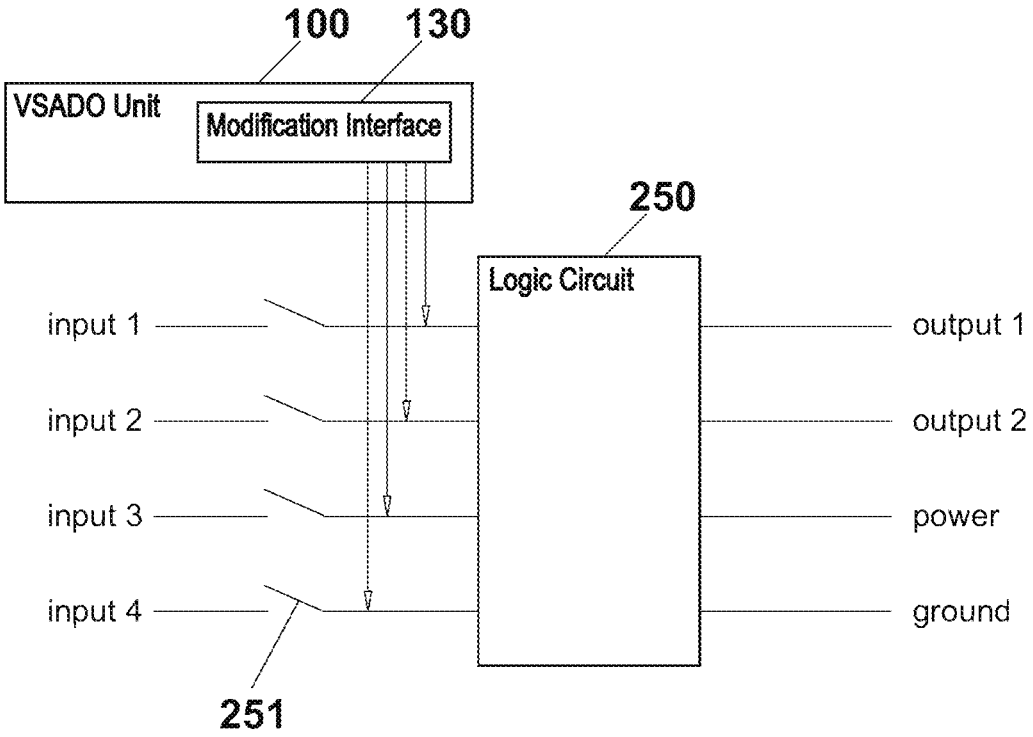


FIG. 30A

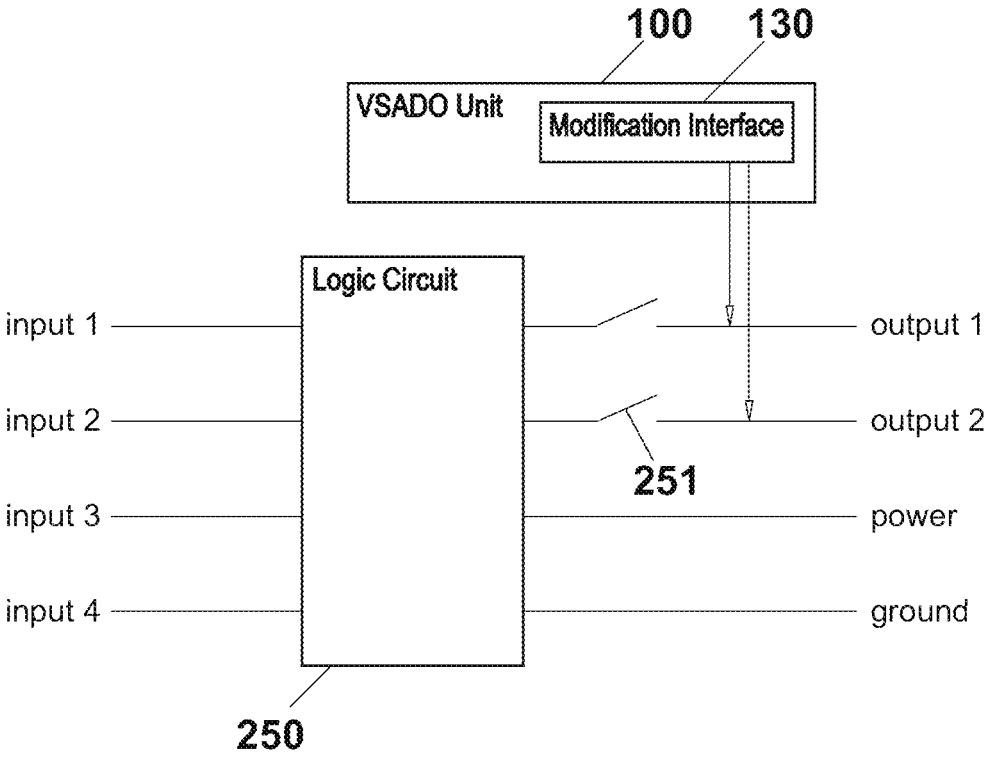


FIG. 30B

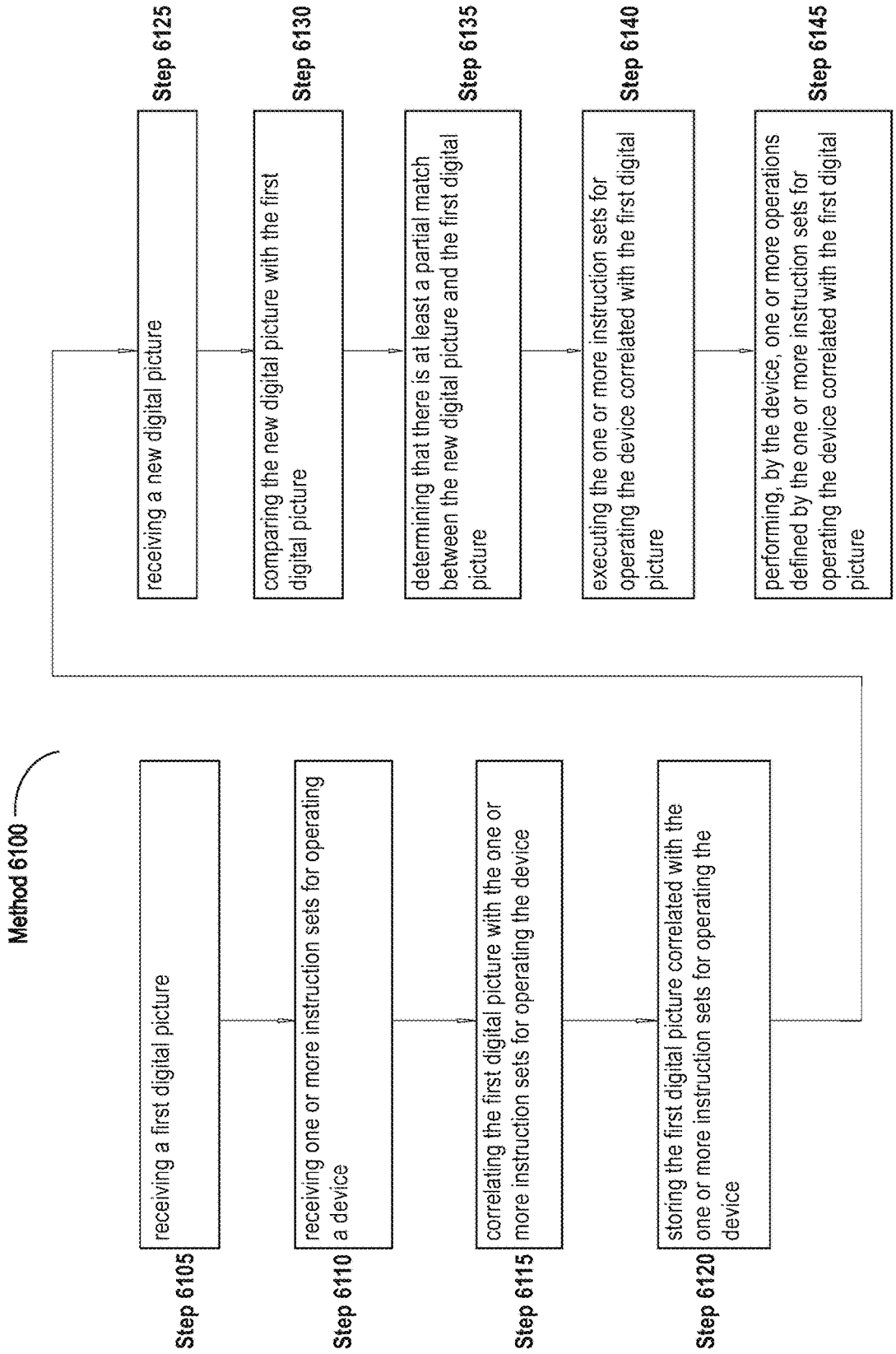

Method 6100
Step 6105
receiving a first digital picture
Step 6110
receiving one or more instruction sets for operating a device
Step 6115
correlating the first digital picture with the one or more instruction sets for operating the device
Step 6120
storing the first digital picture correlated with the one or more instruction sets for operating the device
Step 6125
receiving a new digital picture
Step 6130
comparing the new digital picture with the first digital picture
Step 6135
determining that there is at least a partial match between the new digital picture and the first digital picture
Step 6140
executing the one or more instruction sets for operating the device correlated with the first digital picture
Step 6145
performing, by the device, one or more operations defined by the one or more instruction sets for operating the device correlated with the first digital picture

FIG. 31

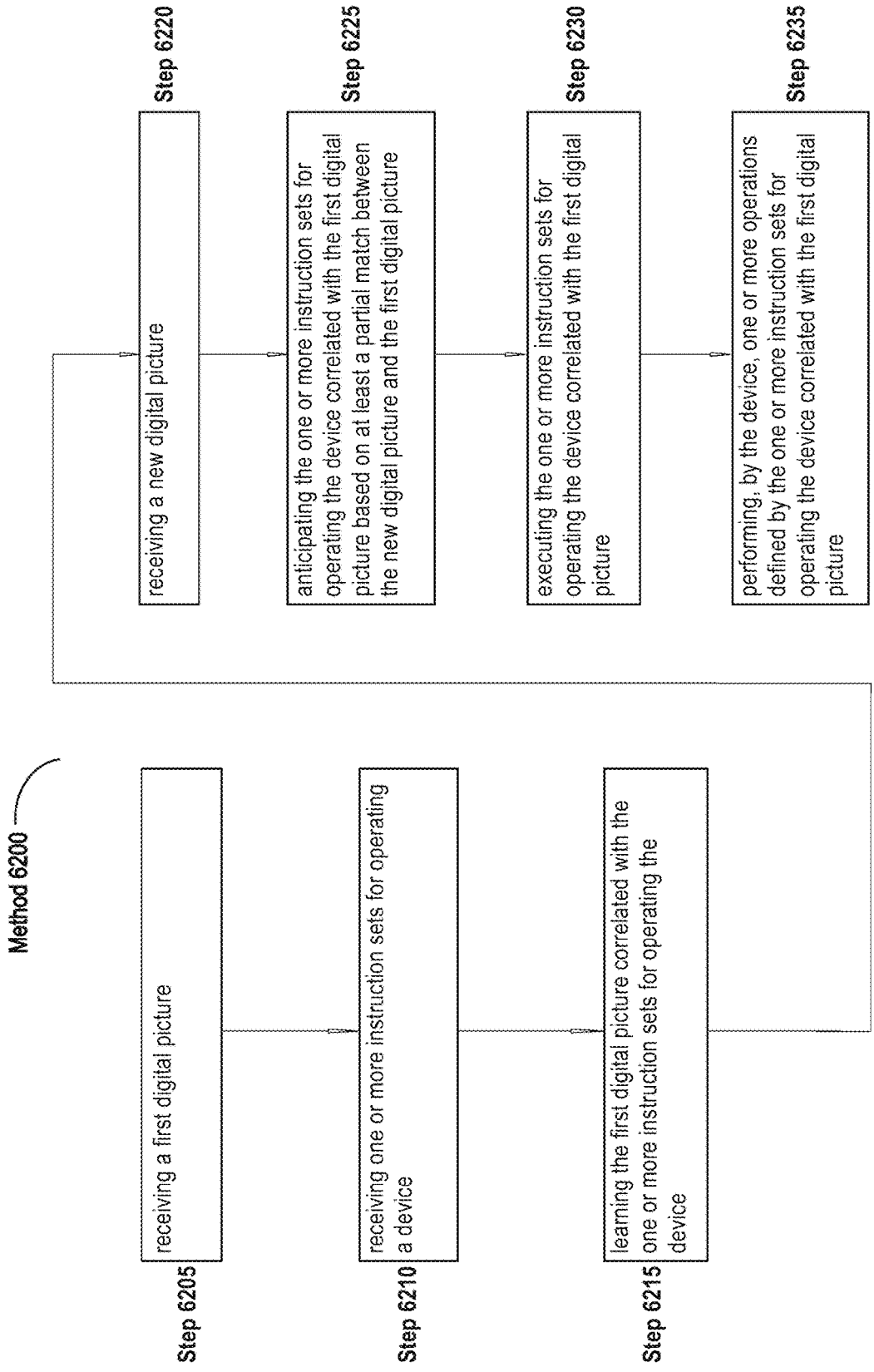

Method 6200
Step 6205
receiving a first digital picture
Step 6210
receiving one or more instruction sets for operating a device
Step 6215
learning the first digital picture correlated with the one or more instruction sets for operating the device
Step 6220
receiving a new digital picture
Step 6225
anticipating the one or more instruction sets for operating the device correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture
Step 6230
executing the one or more instruction sets for operating the device correlated with the first digital picture
Step 6235
performing, by the device, one or more operations defined by the one or more instruction sets for operating the device correlated with the first digital picture

FIG. 32

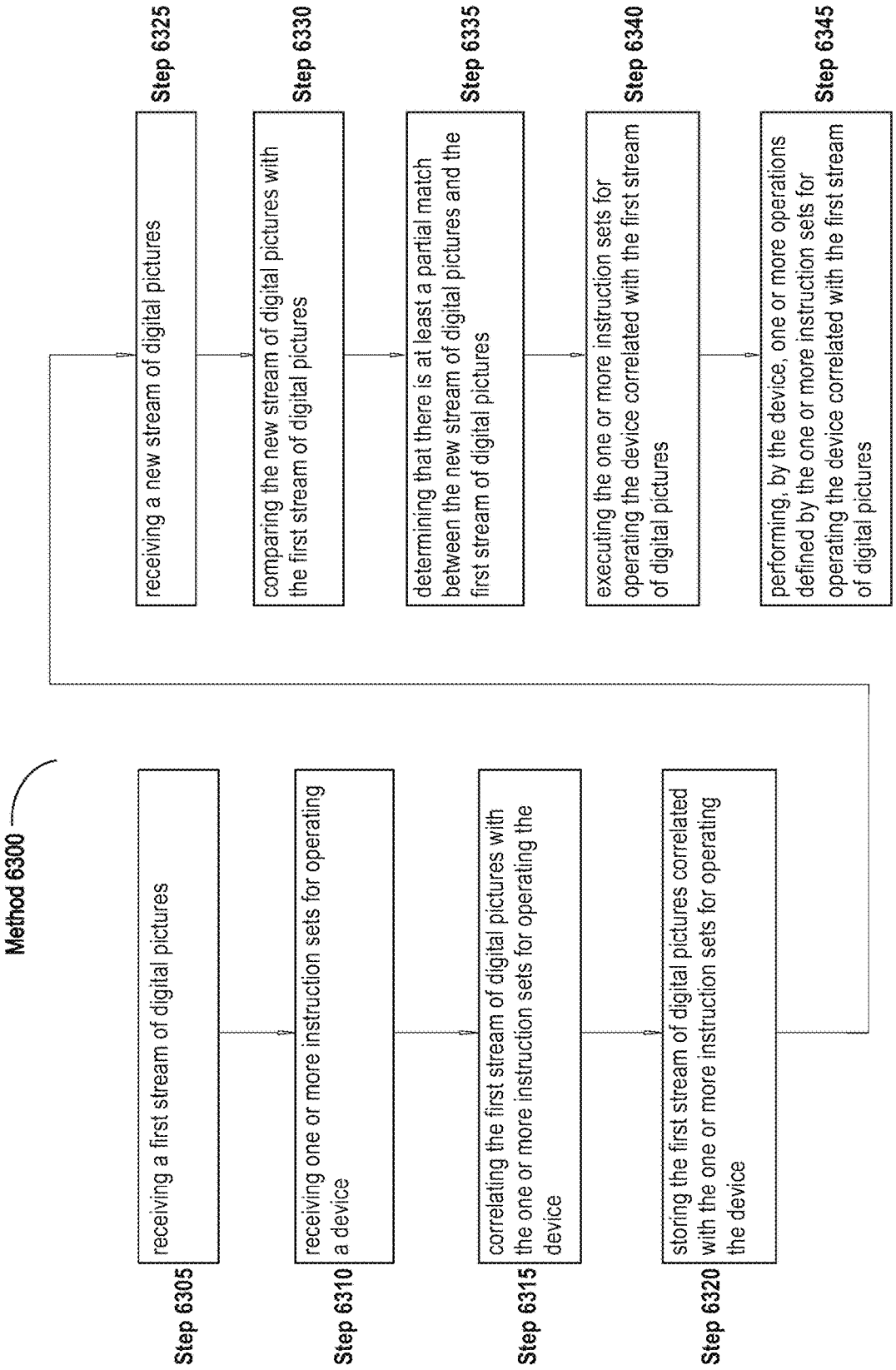

Method 6300
Step 6305
receiving a first stream of digital pictures
Step 6310
receiving one or more instruction sets for operating a device
Step 6315
correlating the first stream of digital pictures with the one or more instruction sets for operating the device
Step 6320
storing the first stream of digital pictures correlated with the one or more instruction sets for operating the device
Step 6325
receiving a new stream of digital pictures
Step 6330
comparing the new stream of digital pictures with the first stream of digital pictures
Step 6335
determining that there is at least a partial match between the new stream of digital pictures and the first stream of digital pictures
Step 6340
executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures
Step 6345
performing, by the device, one or more operations defined by the one or more instruction sets for operating the device correlated with the first stream of digital pictures

FIG. 33

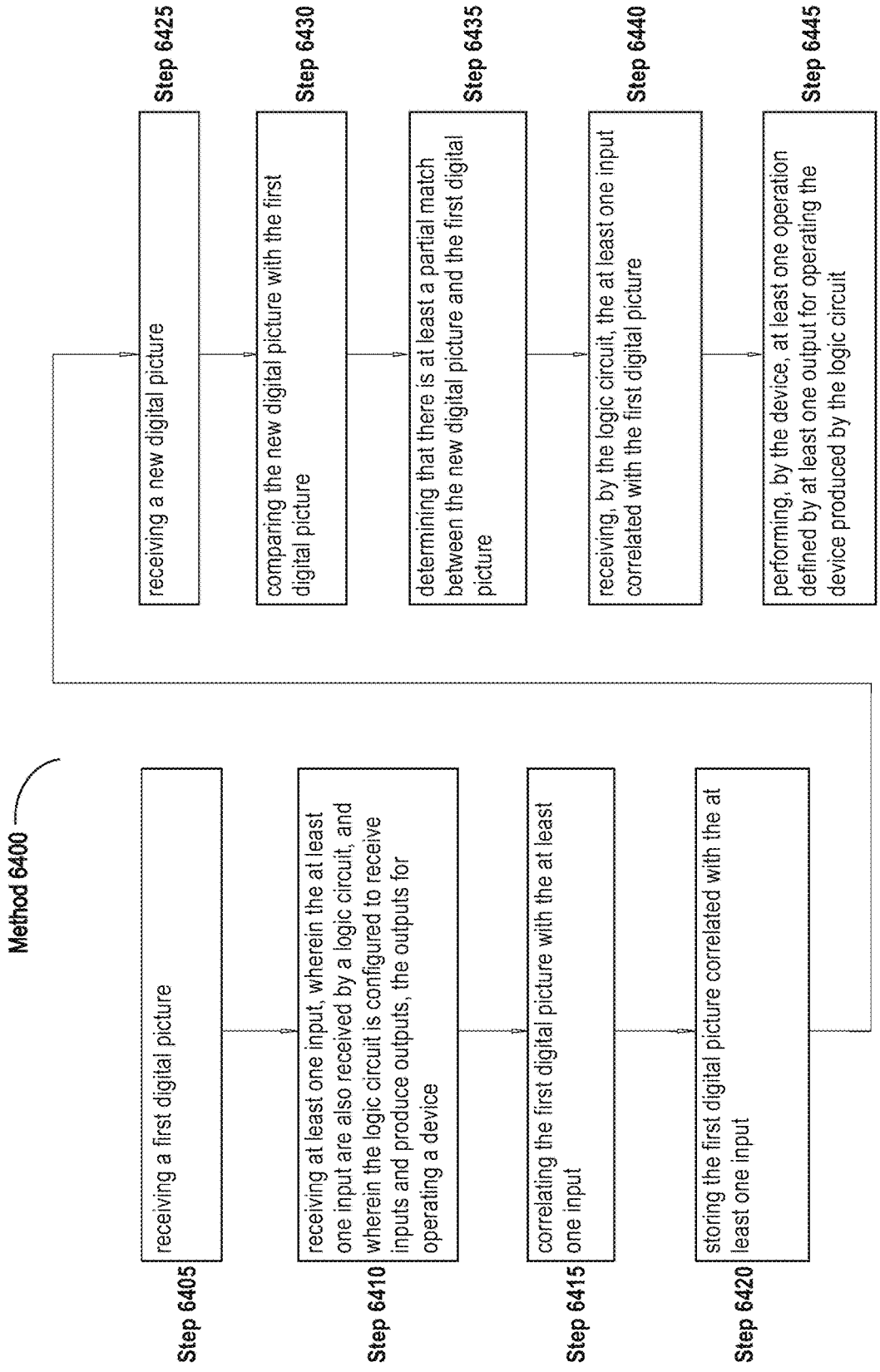

Method 6400
Step 6405
receiving a first digital picture
Step 6410
receiving at least one input, wherein the at least one input are also received by a logic circuit, and wherein the logic circuit is configured to receive inputs and produce outputs, the outputs for operating a device
Step 6415
correlating the first digital picture with the at least one input
Step 6420
storing the first digital picture correlated with the at least one input
Step 6425
receiving a new digital picture
Step 6430
comparing the new digital picture with the first digital picture
Step 6435
determining that there is at least a partial match between the new digital picture and the first digital picture
Step 6440
receiving, by the logic circuit, the at least one input correlated with the first digital picture
Step 6445
performing, by the device, at least one operation defined by at least one output for operating the device produced by the logic circuit

FIG. 34

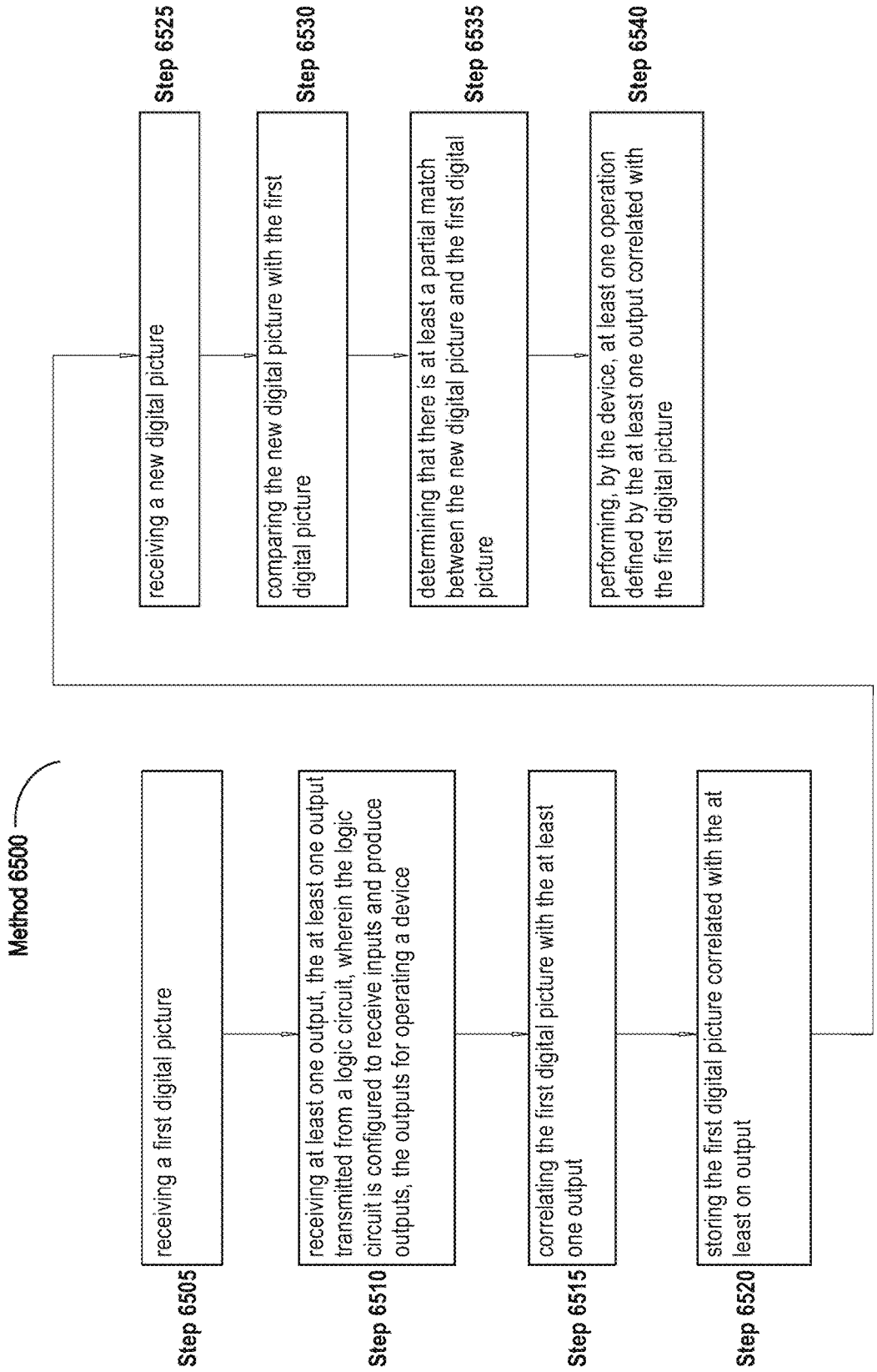

Method 6500
Step 6505
receiving a first digital picture
Step 6510
receiving at least one output, the at least one output transmitted from a logic circuit, wherein the logic circuit is configured to receive inputs and produce outputs, the outputs for operating a device
Step 6515
correlating the first digital picture with the at least one output
Step 6520
storing the first digital picture correlated with the at least on output
Step 6525
receiving a new digital picture
Step 6530
comparing the new digital picture with the first digital picture
Step 6535
determining that there is at least a partial match between the new digital picture and the first digital picture
Step 6540
performing, by the device, at least one operation defined by the at least one output correlated with the first digital picture

FIG. 35

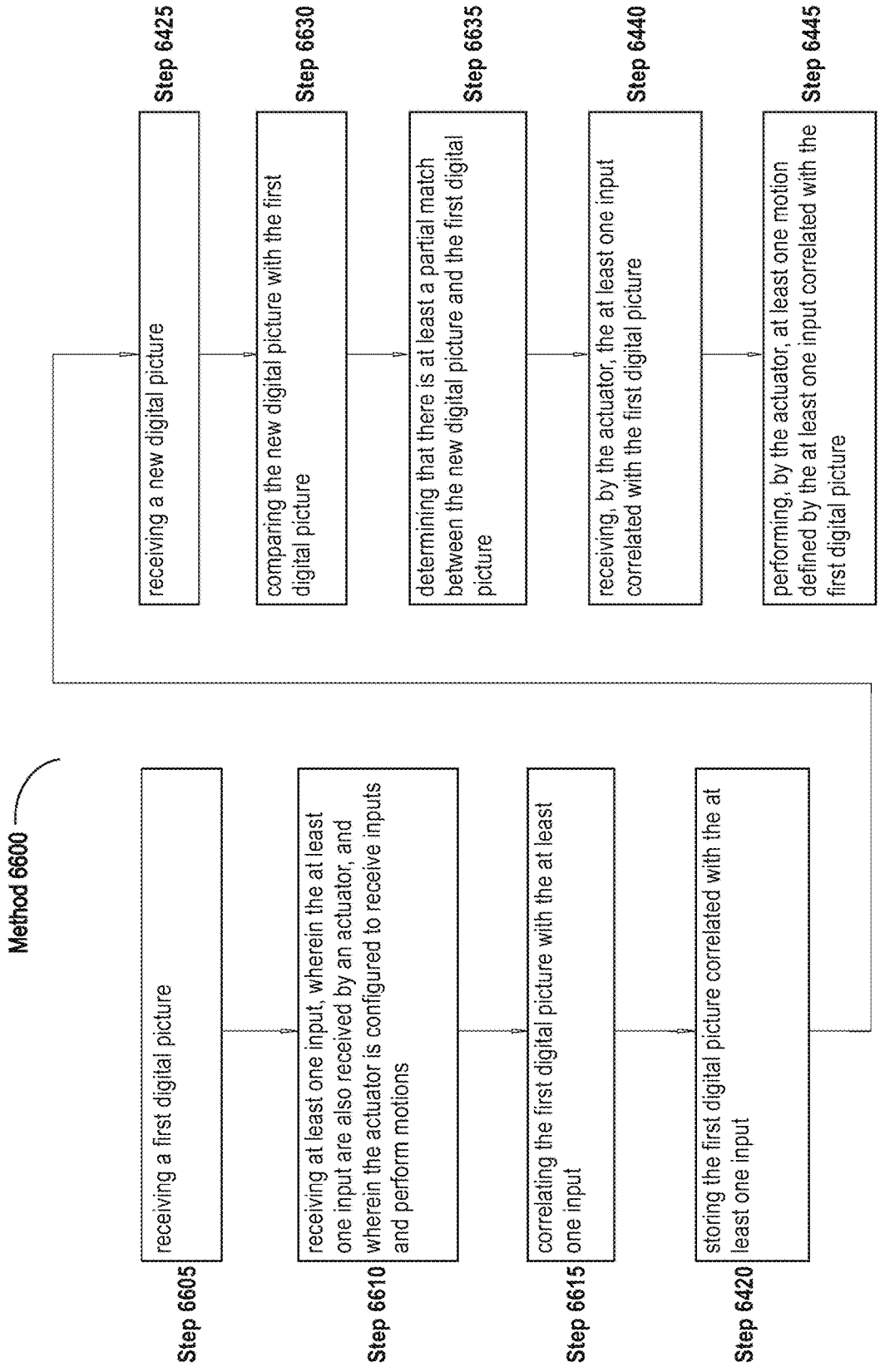

Method 6600
Step 6605
receiving a first digital picture
Step 6610
receiving at least one input, wherein the at least one input are also received by an actuator, and wherein the actuator is configured to receive inputs and perform motions
Step 6615
correlating the first digital picture with the at least one input
Step 6420
storing the first digital picture correlated with the at least one input
Step 6425
receiving a new digital picture
Step 6630
comparing the new digital picture with the first digital picture
Step 6635
determining that there is at least a partial match between the new digital picture and the first digital picture
Step 6440
receiving, by the actuator, the at least one input correlated with the first digital picture
Step 6445
performing, by the actuator, at least one motion defined by the at least one input correlated with the first digital picture

FIG. 36

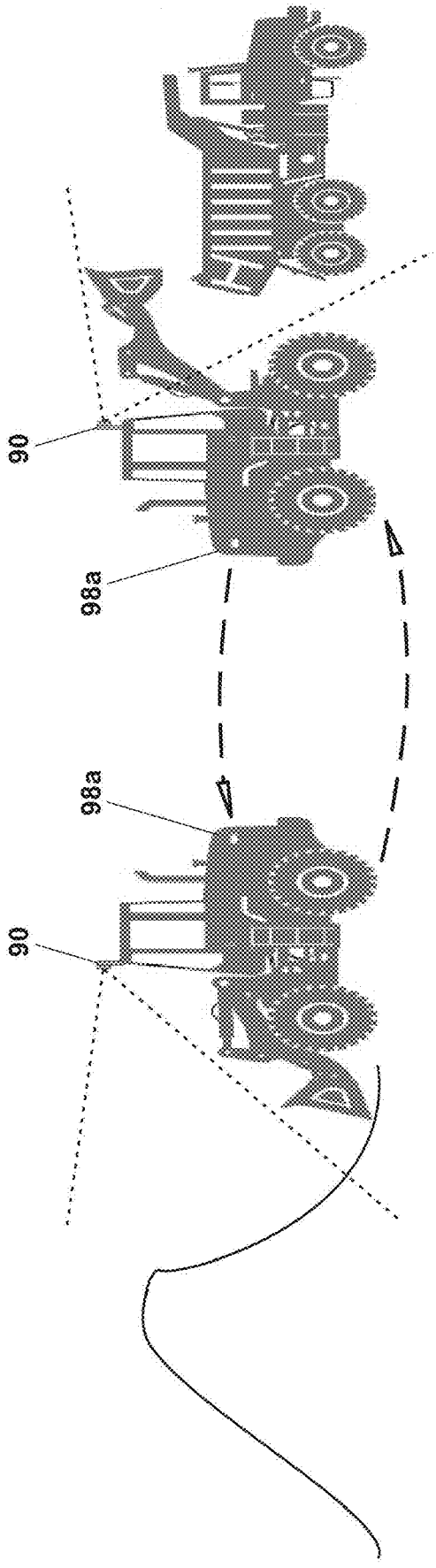


FIG. 37

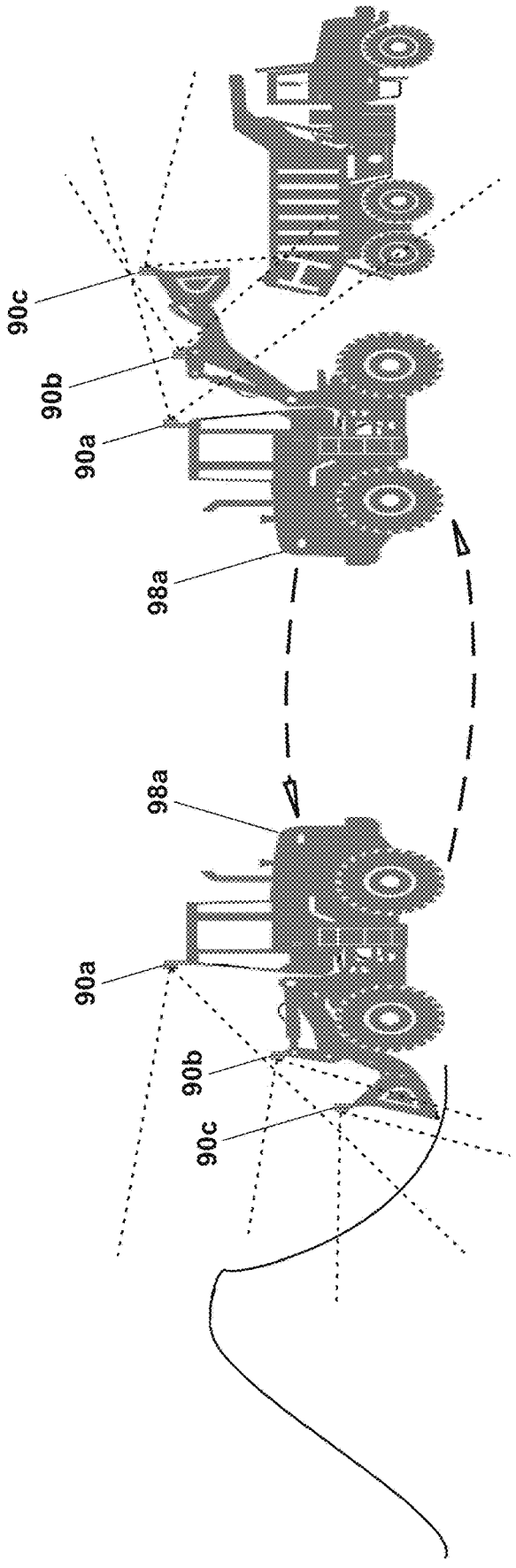


FIG. 38

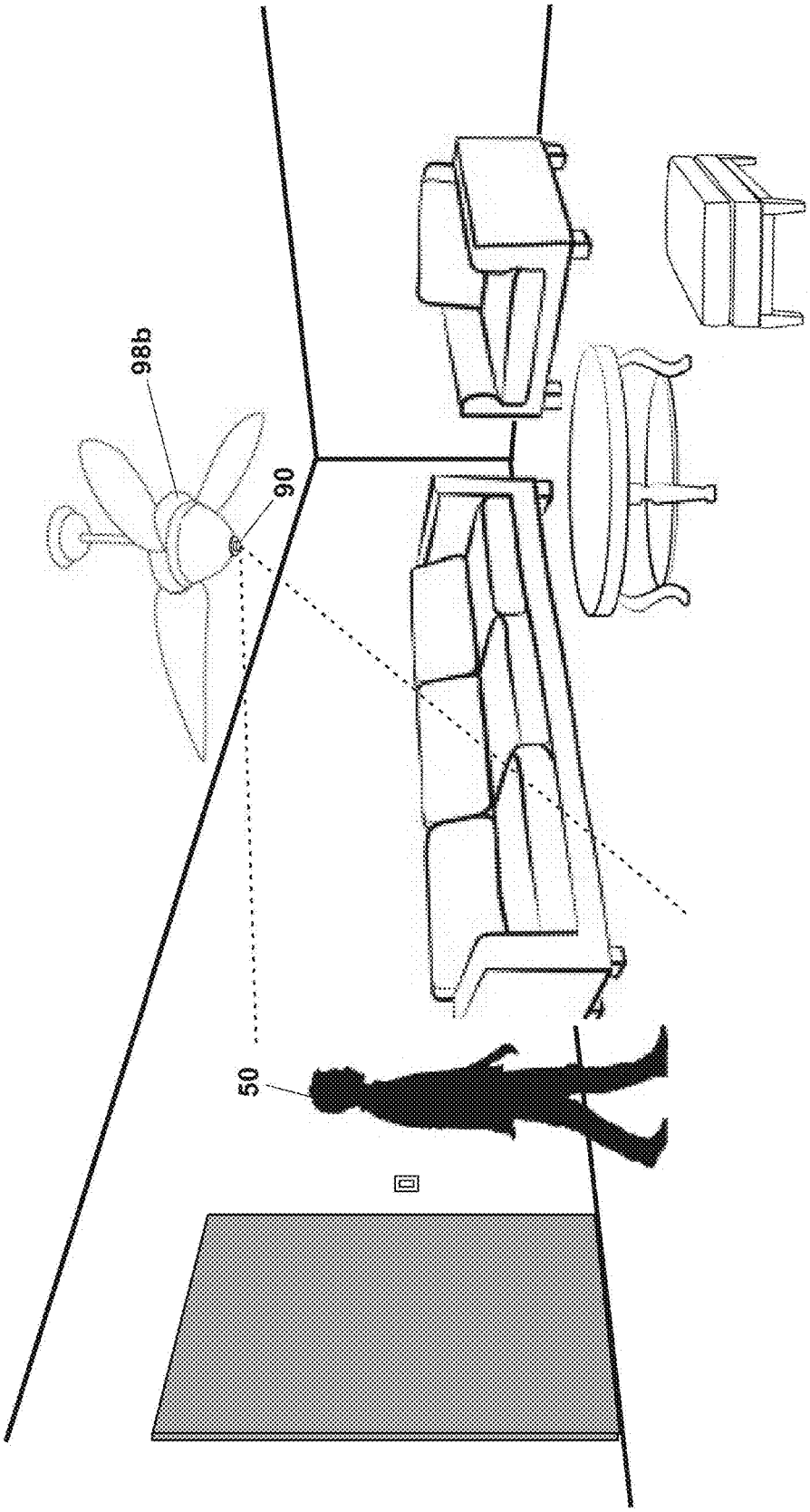


FIG. 39

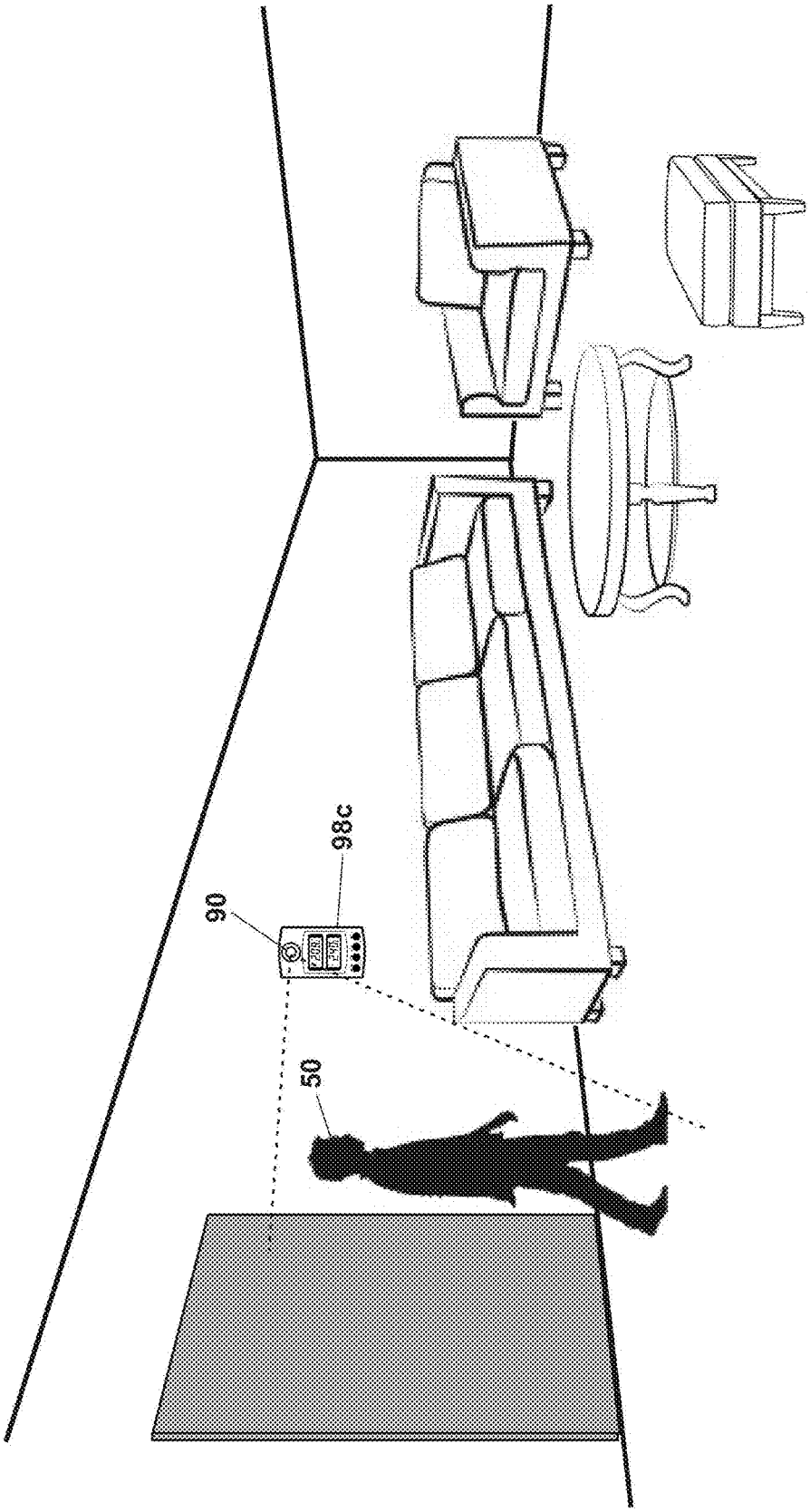


FIG. 40

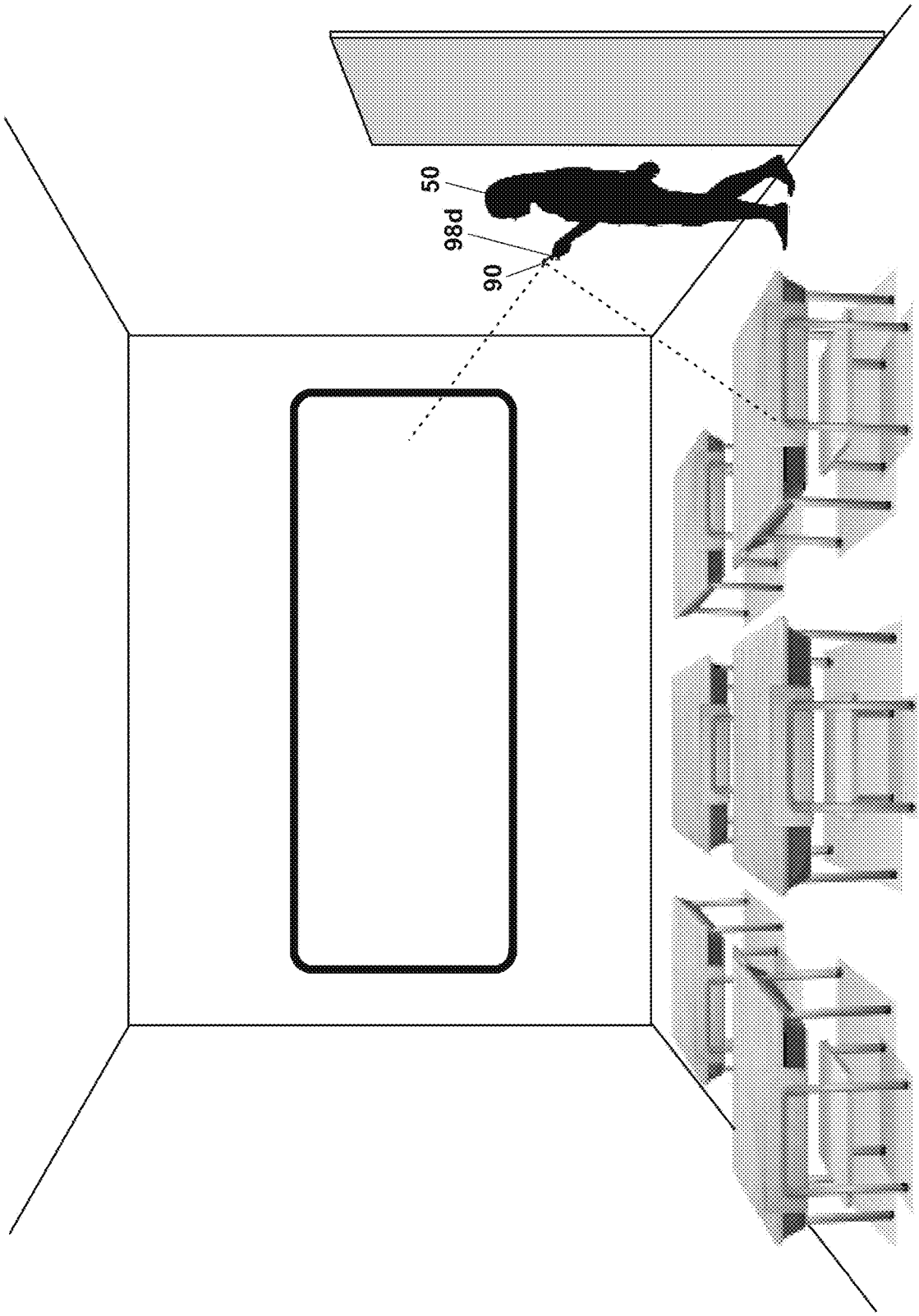


FIG. 41

MACHINE LEARNING FOR COMPUTING ENABLED SYSTEMS AND/OR DEVICES

CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation of, and claims priority under 35 U.S.C. § 120 from, nonprovisional U.S. patent application Ser. No. 15/822,150 entitled "MACHINE LEARNING FOR COMPUTING ENABLED SYSTEMS AND/OR DEVICES", filed on Nov. 26, 2017. The disclosure of the foregoing document is incorporated herein by reference.

FIELD

The disclosure generally relates to computing enabled systems and/or devices.

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BACKGROUND

Computing enabled systems and/or devices range from appliances, toys, entertainment electronics, computers, and communication systems and/or devices to vehicles, robots, and industrial systems and/or devices, and/or others. These systems and/or devices depend on user's input to various degrees for their operation. A machine learning solution is needed for computing enabled systems and/or devices to be less dependent on or fully independent from user input.

SUMMARY OF THE INVENTION

In some aspects, the disclosure relates to a system. The system may be implemented at least in part on one or more computing devices. In some embodiments, the system comprises a processor circuit configured to execute instruction sets for operating a device. The system may further include a memory unit configured to store data. The system may further include a picture capturing apparatus configured to capture digital pictures. The system may further include an artificial intelligence unit. In some embodiments, the artificial intelligence unit may be configured to: receive a first digital picture from the picture capturing apparatus. The artificial intelligence unit may be further configured to: receive one or more instruction sets for operating the device from the processor circuit. The artificial intelligence unit may be further configured to: learn the first digital picture correlated with the one or more instruction sets for operating the device. The artificial intelligence unit may be further configured to: receive a new digital picture from the picture capturing apparatus. The artificial intelligence unit may be further configured to: anticipate the one or more instruction sets for operating the device correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture. The artificial intelligence unit may be further configured to: cause the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture, the executing performed in response to the anticipating of the artificial intelligence unit, wherein the device performs one or more operations defined by the one or more instruction sets for operating the device correlated with the first digital picture, the one or more operations performed in response to the executing by the processor circuit.

In certain embodiments, at least one of the processor circuit, the memory unit, the picture capturing apparatus, or the artificial intelligence unit are part of, operating on, or coupled to the device. In further embodiments, the device includes one or more devices. In further embodiments, the device includes a smartphone, a fixture, a control device, a computing enabled device, or a computer.

In some embodiments, the processor circuit includes one or more processor circuits. In further embodiments, the processor circuit includes a logic circuit. The logic circuit may include a microcontroller. The one or more instruction sets may include one or more inputs into or one or more outputs from the logic circuit.

In certain embodiments, the processor circuit includes a logic circuit, the instruction sets for operating the device include inputs into the logic circuit, and executing instruction sets for operating the device includes performing logic operations on the inputs into the logic circuit and producing outputs for operating the device. The logic circuit may include a microcontroller. In further embodiments, the processor circuit includes a logic circuit, the instruction sets for operating the device include outputs from the logic circuit for operating the device, and executing instruction sets for operating the device includes performing logic operations on inputs into the logic circuit and producing the outputs from the logic circuit for operating the device.

In some embodiments, the memory unit includes one or more memory units. In further embodiments, the memory unit resides on a remote computing device, the remote computing device coupled to the processor circuit via a network. The remote computing device may include a server.

In some embodiments, the picture capturing apparatus includes one or more picture capturing apparatuses. In further embodiments, the picture capturing apparatus includes a motion picture camera or a still picture camera. In further embodiments, the picture capturing apparatus resides on a remote device, the remote device coupled to the processor circuit via a network.

In certain embodiments, the artificial intelligence unit is coupled to the picture capturing apparatus. In further embodiments, the artificial intelligence unit is coupled to the memory unit. In further embodiments, the artificial intelligence unit is part of, operating on, or coupled to the processor circuit. In further embodiments, the system further comprises: a second processor circuit, wherein the artificial intelligence unit is part of, operating on, or coupled to the second processor circuit. In further embodiments, the artificial intelligence unit is part of, operating on, or coupled to a remote computing device, the remote computing device coupled to the processor circuit via a network. In further embodiments, the artificial intelligence unit includes a circuit, a computing apparatus, or a computing system attachable to the processor circuit. In further embodiments, the artificial intelligence unit includes a circuit, a computing apparatus, or a computing system attachable to the device. In further embodiments, the artificial intelligence unit is attachable to an application for operating the device, the application running on the processor circuit. In further embodiments, the artificial intelligence unit includes a circuit, a

computing apparatus, or a computing system built into the processor circuit. In further embodiments, the artificial intelligence unit includes a circuit, a computing apparatus, or a computing system built into the device. In further embodiments, the artificial intelligence unit is built into an application for operating the device, the application running on the processor circuit. In further embodiments, the artificial intelligence unit is provided as a feature of the processor circuit. In further embodiments, the artificial intelligence unit is provided as a feature of an application running on the processor circuit. In further embodiments, the artificial intelligence unit is provided as a feature of the device. In further embodiments, the artificial intelligence unit is further configured to: take control from, share control with, or release control to the processor circuit. In further embodiments, the artificial intelligence unit is further configured to: take control from, share control with, or release control to an application or an object of the application, the application running on the processor circuit. In further embodiments, the artificial intelligence unit is further configured to: take control from, share control with, or release control to a user or a system.

In some embodiments, the first digital picture includes a stream of digital pictures. In further embodiments, the new digital picture includes a stream of digital pictures. In further embodiments, the first and the new digital pictures portray the device's surrounding. In further embodiments, the first and the new digital pictures portray a remote device's surrounding. In further embodiments, the first or the new digital picture includes a JPEG picture, a GIF picture, a TIFF picture, a PNG picture, a PDF picture, or a digitally encoded picture. The stream of digital pictures may include a MPEG motion picture, an AVI motion picture, a FLV motion picture, a MOV motion picture, a RM motion picture, a SWF motion picture, a WMV motion picture, a DivX motion picture, or a digitally encoded motion picture. In further embodiments, the first digital picture includes a comparative digital picture whose at least one portion can be used for comparisons with at least one portion of digital pictures subsequent to the first digital picture, the digital pictures subsequent to the first digital picture comprising the new digital picture. In further embodiments, the first digital picture includes a comparative digital picture that can be used for comparisons with the new digital picture. In further embodiments, the new digital picture includes an anticipatory digital picture whose correlated one or more instruction sets can be used for anticipation of one or more instruction sets to be executed by the processor circuit.

In certain embodiments, the one or more instruction sets for operating the device include one or more instruction sets that temporally correspond to the first digital picture. The one or more instruction sets that temporally correspond to the first digital picture may include one or more instruction sets executed at a time of the capturing the first digital picture. The one or more instruction sets that temporally correspond to the first digital picture may include one or more instruction sets executed prior to the capturing the first digital picture. The one or more instruction sets that temporally correspond to the first digital picture may include one or more instruction sets executed within a threshold period of time prior to the capturing the first digital picture. The one or more instruction sets that temporally correspond to the first digital picture may include one or more instruction sets executed subsequent to the capturing the first digital picture. The one or more instruction sets that temporally correspond to the first digital picture may include one or more instruction sets executed within a threshold period of time subsequent to the capturing the first digital picture. The one or more instruction sets that temporally correspond to the first digital picture may include one or more instruction sets executed within a threshold period of time prior to the capturing the first digital picture or a threshold period of time subsequent to the capturing the first digital picture. The one or more instruction sets that temporally correspond to the first digital picture may include one or more instruction sets executed from a start of capturing a preceding digital picture to a start of capturing the first digital picture. The one or more instruction sets that temporally correspond to the first digital picture may include one or more instruction sets executed from a start of capturing the first digital picture to a start of capturing a subsequent digital picture. The one or more instruction sets that temporally correspond to the first digital picture may include one or more instruction sets executed from a completion of capturing a preceding digital picture to a completion of capturing the first digital picture. The one or more instruction sets that temporally correspond to the first digital picture include one or more instruction sets executed from a completion of capturing the first digital picture to a completion of capturing a subsequent digital picture.

In some embodiments, the one or more instruction sets for operating the device are executed by the processor circuit. In further embodiments, the one or more instruction sets for operating the device are part of an application for operating the device, the application running on the processor circuit. In further embodiments, the one or more instruction sets for operating the device include one or more inputs into or one or more outputs from the processor circuit. In further embodiments, the one or more instruction sets for operating the device include values or states of one or more registers or elements of the processor circuit. In further embodiments, an instruction set includes at least one of: a command, a keyword, a symbol, an instruction, an operator, a variable, a value, an object, a data structure, a function, a parameter, a state, a signal, an input, an output, a character, a digit, or a reference thereto. In further embodiments, the one or more instruction sets include a source code, a bytecode, an intermediate code, a compiled code, an interpreted code, a translated code, a runtime code, an assembly code, a structured query language (SQL) code, or a machine code. In further embodiments, the one or more instruction sets include one or more code segments, lines of code, statements, instructions, functions, routines, subroutines, or basic blocks. In further embodiments, the processor circuit includes a logic circuit. The one or more instruction sets for operating the device include one or more inputs into a logic circuit. The one or more instruction sets for operating the device include one or more outputs from a logic circuit. In further embodiments, the one or more instruction sets for operating the device include one or more instruction sets for operating an application or an object of the application, the application running on the processor circuit.

In some embodiments, the receiving the one or more instruction sets for operating the device from the processor circuit includes obtaining the one or more instruction sets from the processor circuit. In further embodiments, the receiving the one or more instruction sets for operating the device from the processor circuit includes receiving the one or more instruction sets as they are executed by the processor circuit. In further embodiments, the receiving the one or more instruction sets for operating the device from the processor circuit includes receiving the one or more instruction sets for operating the device from a register or an element of the processor circuit. In further embodiments, the

receiving the one or more instruction sets for operating the device from the processor circuit includes receiving the one or more instruction sets for operating the device from an element that is part of, operating on, or coupled to the processor circuit. In further embodiments, the receiving the one or more instruction sets for operating the device from the processor circuit includes receiving the one or more instruction sets for operating the device from at least one of: the memory unit, the device, a virtual machine, a runtime engine, a hard drive, a storage device, a peripheral device, a network connected device, or a user. In further embodiments, the receiving the one or more instruction sets for operating the device from the processor circuit includes receiving the one or more instruction sets from a plurality of processor circuits, applications, memory units, devices, virtual machines, runtime engines, hard drives, storage devices, peripheral devices, network connected devices, or users.

In certain embodiments, the processor circuit includes a logic circuit, and wherein the receiving the one or more instruction sets for operating the device from the processor circuit includes receiving the one or more instruction sets for operating the device from the logic circuit. The logic circuit may include a microcontroller. The receiving the one or more instruction sets for operating the device from the logic circuit may include receiving the one or more instruction sets for operating the device from an element of the logic circuit. The receiving the one or more instruction sets for operating the device from the logic circuit may include receiving one or more inputs into the logic circuit. The receiving the one or more instruction sets for operating the device from the logic circuit may include receiving one or more outputs from the logic circuit.

In some embodiments, the receiving the one or more instruction sets for operating the device from the processor circuit includes receiving the one or more instruction sets for operating the device from an application for operating the device, the application running on the processor circuit. In further embodiments, the system further comprises: an application including instruction sets for operating the device, the application running on the processor circuit, wherein the receiving the one or more instruction sets for operating the device from the processor circuit includes receiving the one or more instruction sets for operating the device from the application.

In certain embodiments, the receiving the one or more instruction sets for operating the device from the processor circuit includes receiving the one or more instruction sets at a source code write time, a compile time, an interpretation time, a translation time, a linking time, a loading time, or a runtime. In further embodiments, the receiving the one or more instruction sets for operating the device from the processor circuit includes at least one of: tracing, profiling, or instrumentation of a source code, a bytecode, an intermediate code, a compiled code, an interpreted code, a translated code, a runtime code, an assembly code, a structured query language (SQL) code, or a machine code. In further embodiments, the receiving the one or more instruction sets for operating the device from the processor circuit includes at least one of: tracing, profiling, or instrumentation of an element that is part of, operating on, or coupled to the processor circuit. In further embodiments, the receiving the one or more instruction sets for operating the device from the processor circuit includes at least one of: tracing, profiling, or instrumentation of a register of the processor circuit, the memory unit, a storage, or a repository where the one or more instruction sets for operating the device are stored. In further embodiments, the receiving the one or more instruction sets for operating the device from the processor circuit includes at least one of: tracing, profiling, or instrumentation of the processor circuit, the device, a virtual machine, a runtime engine, an operating system, an execution stack, a program counter, or a processing element. In further embodiments, the receiving the one or more instruction sets for operating the device from the processor circuit includes at least one of: tracing, profiling, or instrumentation of the processor circuit or tracing, profiling, or instrumentation of a component of the processor circuit. In further embodiments, the receiving the one or more instruction sets for operating the device from the processor circuit includes at least one of: tracing, profiling, or instrumentation of an application or an object of the application, the application running on the processor circuit. In further embodiments, the receiving the one or more instruction sets for operating the device from the processor circuit includes at least one of: tracing, profiling, or instrumentation at a source code write time, a compile time, an interpretation time, a translation time, a linking time, a loading time, or a runtime. In further embodiments, the receiving the one or more instruction sets for operating the device from the processor circuit includes at least one of: tracing, profiling, or instrumentation of one or more of code segments, lines of code, statements, instructions, functions, routines, subroutines, or basic blocks. In further embodiments, the receiving the one or more instruction sets for operating the device from the processor circuit includes at least one of: tracing, profiling, or instrumentation of a user input. In further embodiments, the receiving the one or more instruction sets for operating the device from the processor circuit includes at least one of: a manual, an automatic, a dynamic, or a just in time (JIT) tracing, profiling, or instrumentation. In further embodiments, the receiving the one or more instruction sets for operating the device from the processor circuit includes utilizing at least one of: a .NET tool, a .NET application programming interface (API), a Java tool, a Java API, a logging tool, or an independent tool for obtaining instruction sets. In further embodiments, the receiving the one or more instruction sets for operating the device from the processor circuit includes utilizing an assembly language. In further embodiments, the receiving the one or more instruction sets for operating the device from the processor circuit includes utilizing a branch or a jump. In further embodiments, the receiving the one or more instruction sets for operating the device from the processor circuit includes a branch tracing or a simulation tracing.

In some embodiments, the system further comprises: an interface configured to receive instruction sets, wherein the one or more instruction sets for operating the device are received by the interface. The interface may include an acquisition interface.

In certain embodiments, the first digital picture correlated with the one or more instruction sets for operating the device includes a unit of knowledge of how the device operated in a visual surrounding. In further embodiments, the first digital picture correlated with the one or more instruction sets for operating the device is included in a neuron, a node, a vertex, or an element of a data structure. The data structure may include a neural network, a graph, a collection of sequences, a sequence, a collection of knowledge cells, a knowledgebase, or a knowledge structure. Some of the neurons, nodes, vertices, or elements may be interconnected.

In some embodiments, the first digital picture correlated with the one or more instruction sets for operating the device is structured into a knowledge cell. In further embodiments, the knowledge cell includes a unit of knowledge of how the

device operated in a visual surrounding. In further embodiments, the knowledge cell is included in a neuron, a node, a vertex, or an element of a data structure. The data structure may include a neural network, a graph, a collection of sequences, a sequence, a collection of knowledge cells, a knowledgebase, or a knowledge structure. Some of the neurons, nodes, vertices, or elements may be interconnected.

In certain embodiments, the learning the first digital picture correlated with the one or more instruction sets for operating the device includes correlating the first digital picture with the one or more instruction sets for operating the device. The correlating the first digital picture with the one or more instruction sets for operating the device may include generating a knowledge cell, the knowledge cell comprising the first digital picture correlated with the one or more instruction sets for operating the device. The correlating the first digital picture with the one or more instruction sets for operating the device may include structuring a unit of knowledge of how the device operated in a visual surrounding.

In some embodiments, the learning the first digital picture correlated with the one or more instruction sets for operating the device includes learning a user's knowledge, style, or methodology of operating the device in a visual surrounding. In further embodiments, the learning the first digital picture correlated with the one or more instruction sets for operating the device includes spontaneous learning the first digital picture correlated with the one or more instruction sets for operating the device.

In some embodiments, the learning the first digital picture correlated with the one or more instruction sets for operating the device includes storing, into the memory unit, the first digital picture correlated with the one or more instruction sets for operating the device, the first digital picture correlated with the one or more instruction sets for operating the device being part of a stored plurality of digital pictures correlated with one or more instruction sets for operating the device. In further embodiments, the plurality of digital pictures correlated with one or more instruction sets for operating the device include a neural network, a graph, a collection of sequences, a sequence, a collection of knowledge cells, a knowledgebase, a knowledge structure, or a data structure. In further embodiments, the plurality of digital pictures correlated with one or more instruction sets for operating the device are organized into a neural network, a graph, a collection of sequences, a sequence, a collection of knowledge cells, a knowledgebase, a knowledge structure, or a data structure. In further embodiments, each of the plurality of digital pictures correlated with one or more instruction sets for operating the device is included in a neuron, a node, a vertex, or an element of a data structure. The data structure may include a neural network, a graph, a collection of sequences, a sequence, a collection of knowledge cells, a knowledgebase, or a knowledge structure. Some of the neurons, nodes, vertices, or elements may be interconnected. In further embodiments, the plurality of digital pictures correlated with one or more instruction sets for operating the device include a user's knowledge, style, or methodology of operating the device in visual surroundings. In further embodiments, the plurality of digital pictures correlated with one or more instruction sets for operating the device are stored on a remote computing device. In further embodiments, the plurality of digital pictures correlated with one or more instruction sets for operating the device include an artificial intelligence system for knowledge structuring, storing, or representation. The artificial intelligence system for knowledge structuring, storing, or representation may include at least one of: a deep learning system, a supervised learning system, an unsupervised learning system, a neural network, a search-based system, an optimization-based system, a logic-based system, a fuzzy logic-based system, a tree-based system, a graph-based system, a hierarchical system, a symbolic system, a sub-symbolic system, an evolutionary system, a genetic system, a multi-agent system, a deterministic system, a probabilistic system, or a statistical system.

In certain embodiments, the anticipating the one or more instruction sets for operating the device correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture includes comparing at least one portion of the new digital picture with at least one portion of the first digital picture. The at least one portion of the new digital picture may include at least one region, at least one feature, or at least one pixel of the new digital picture. The at least one portion of the first digital picture may include at least one region, at least one feature, or at least one pixel of the first digital picture. The comparing the at least one portion of the new digital picture with the at least one portion of the first digital picture may include comparing at least one region of the new digital picture with at least one region of the first digital picture. The comparing the at least one portion of the new digital picture with the at least one portion of the first digital picture may include comparing at least one feature of the new digital picture with at least one feature of the first digital picture. The at least one portion of the new digital picture with the at least one portion of the first digital picture may include comparing at least one pixel of the new digital picture with at least one pixel of the first digital picture. The comparing the at least one portion of the new digital picture with the at least one portion of the first digital picture may include at least one of: performing a color adjustment, performing a size adjustment, performing a content manipulation, utilizing a transparency, or utilizing a mask on the new or the first digital picture. The comparing the at least one portion of the new digital picture with the at least one portion of the first digital picture may include recognizing at least one person or object in the new digital picture and at least one person or object in the first digital picture, and comparing the at least one person or object from the new digital picture with the at least one person or object from the first digital picture.

In some embodiments, he anticipating the one or more instruction sets for operating the device correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture includes determining that there is at least a partial match between the new digital picture and the first digital picture. In further embodiments, the determining that there is at least a partial match between the new digital picture and the first digital picture includes determining that there is at least a partial match between one or more portions of the new digital picture and one or more portions of the first digital picture. In further embodiments, the determining that there is at least a partial match between the new digital picture and the first digital picture includes determining that a similarity between at least one portion of the new digital picture and at least one portion of the first digital picture exceeds a similarity threshold. In further embodiments, the determining that there is at least a partial match between the new digital picture and the first digital picture includes determining a substantial similarity between at least one portion of the new digital picture and at least one portion of the first digital picture. The at least one portion of the new digital picture may include at least one region, at least one feature, or at

least one pixel of the new digital picture. The at least one portion of the first digital picture may include at least one region, at least one feature, or at least one pixel of the first digital picture. The substantial similarity may be achieved when a similarity between the at least one portion of the new digital picture and the at least one portion of the first digital picture exceeds a similarity threshold. The substantial similarity may be achieved when a number or a percentage of matching or partially matching regions from the new digital picture and from the first digital picture exceeds a threshold number or threshold percentage. The substantial similarity may be achieved when a number or a percentage of matching or partially matching features from the new digital picture and from the first digital picture exceeds a threshold number or threshold percentage. The substantial similarity may be achieved when a number or a percentage of matching or partially matching pixels from the new digital picture and from the first digital picture exceeds a threshold number or threshold percentage. The substantial similarity may be achieved when one or more same or similar objects are recognized in the new digital picture and the first digital picture. In further embodiments, the determining that there is at least a partial match between the new digital picture and the first digital picture includes determining that a number or a percentage of matching regions from the new digital picture and from the first digital picture exceeds a threshold number or threshold percentage. The matching regions from the new digital picture and from the first digital picture may be determined factoring in at least one of: a location of a region, an importance of a region, a threshold for a similarity in a region, or a threshold for a difference in a region. In further embodiments, the determining that there is at least a partial match between the new digital picture and the first digital picture includes determining that a number or a percentage of matching features from the new digital picture and from the first digital picture exceeds a threshold number or threshold percentage. The matching features from the new digital picture and from the first digital picture may be determined factoring in at least one of: a type of a feature, an importance of a feature, a location of a feature, a threshold for a similarity in a feature, or a threshold for a difference in a feature. In further embodiments, the determining that there is at least a partial match between the new digital picture and the first digital picture includes determining that a number or a percentage of matching pixels from the new digital picture and from the first digital picture exceeds a threshold number or threshold percentage. The matching pixels from the new digital picture and from the first digital picture may be determined factoring in at least one of: a location of a pixel, a threshold for a similarity in a pixel, or a threshold for a difference in a pixel. In further embodiments, the determining that there is at least a partial match between the new digital picture and the first digital picture includes recognizing a same person or object in the new and the first digital pictures.

In some embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture instead of or prior to an instruction set that would have been executed next. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes modifying one or more instruction sets of the processor circuit. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes modifying a register or an element of the processor circuit. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes inserting the one or more instruction sets for operating the device correlated with the first digital picture into a register or an element of the processor circuit. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes redirecting the processor circuit to the one or more instruction sets for operating the device correlated with the first digital picture. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes redirecting the processor circuit to one or more alternate instruction sets, the alternate instruction sets comprising the one or more instruction sets for operating the device correlated with the first digital picture. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes transmitting, to the processor circuit for execution, the one or more instruction sets for operating the device correlated with the first digital picture. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes issuing an interrupt to the processor circuit and executing the one or more instruction sets for operating the device correlated with the first digital picture following the interrupt. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes modifying an element that is part of, operating on, or coupled to the processor circuit.

In certain embodiments, the processor circuit includes a logic circuit, and wherein the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes causing the logic circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture. The logic circuit may include a microcontroller. The causing the logic circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture may include modifying an element of the logic circuit. The causing the logic circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture may include inserting the one or more instruction sets for operating the device correlated with the first digital picture into an element of the logic circuit. The causing the logic circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture may include redirecting the logic circuit to the one or more instruction sets for operating the device correlated with the first digital picture. The causing the logic circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture may include replacing inputs into the logic circuit with the one or more instruction sets for operating the device correlated with the first digital picture. The causing the logic circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture may include replacing outputs from the logic circuit with the one or more instruction sets for operating the device correlated with the first digital picture.

In certain embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes causing an application for operating the device to execute the one or more instruction sets for operating the device correlated with the first digital picture, the application running on the processor circuit.

In further embodiments, the system further comprises: an application including instruction sets for operating the device, the application running on the processor circuit, wherein the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes modifying the application.

In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes redirecting an application to the one or more instruction sets for operating the device correlated with the first digital picture, the application running on the processor circuit. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes redirecting an application to one or more alternate instruction sets, the application running on the processor circuit, the alternate instruction sets comprising the one or more instruction sets for operating the device correlated with the first digital picture. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes modifying one or more instruction sets of an application, the application running on the processor circuit. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes modifying a source code, a bytecode, an intermediate code, a compiled code, an interpreted code, a translated code, a runtime code, an assembly code, or a machine code. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes modifying at least one of: the memory unit, a register of the processor circuit, a storage, or a repository where instruction sets are stored or used. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes modifying one or more instruction sets for operating an application or an object of the application, the application running on the processor circuit. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes modifying at least one of: an element of the processor circuit, an element of the device, a virtual machine, a runtime engine, an operating system, an execution stack, a program counter, or a user input. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes modifying one or more instruction sets at a source code write time, a compile time, an interpretation time, a translation time, a linking time, a loading time, or a runtime. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes modifying one or more code segments, lines of code, statements, instructions, functions, routines, subroutines, or basic blocks. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes a manual, an automatic, a dynamic, or a just in time (JIT) instrumentation of an application, the application running on the processor circuit. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes utilizing one or more of a .NET tool, a .NET application programming interface (API), a Java tool, a Java API, an operating system tool, or an independent tool for modifying instruction sets. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes utilizing at least one of: a dynamic, an interpreted, or a scripting programming language. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes utilizing at least one of: a dynamic code, a dynamic class loading, or a reflection. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes utilizing an assembly language. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes utilizing at least one of: a metaprogramming, a self-modifying code, or an instruction set modification tool. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes utilizing at least one of: just in time (JIT) compiling, JIT interpretation, JIT translation, dynamic recompiling, or binary rewriting. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes utilizing at least one of: a dynamic expression creation, a dynamic expression execution, a dynamic function creation, or a dynamic function execution. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes adding or inserting additional code into a code of an application, the application running on the processor circuit. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes at least one of: modifying, removing, rewriting, or overwriting a code of an application, the application running on the processor circuit. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture includes at least one of: branching, redirecting, extending, or hot swapping a code of an application, the application running on the processor circuit. The branching or redirecting the code may include inserting at least one of: a branch, a jump, or a means for redirecting an execution. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes implementing a user's knowledge, style, or methodology of operating the device in a visual surrounding.

In some embodiments, the system further comprises: an interface configured to cause execution of instruction sets, wherein the executing the one or more instruction sets for

operating the device correlated with the first digital picture is caused by the interface. The interface may include a modification interface.

In certain embodiments, the one or more operations defined by the one or more instruction sets for operating the device correlated with the first digital picture include at least one of: an operation with or by a smartphone, an operation with or by a fixture, an operation with or by a control device, or an operation with or by a computer or computing enabled device.

In some embodiments, the performing the one or more operations defined by the one or more instruction sets for operating the device correlated with the first digital picture includes implementing a user's knowledge, style, or methodology of operating the device in a visual surrounding.

In certain embodiments, the system further comprises: an application running on the processor circuit.

In some embodiments, the instruction sets for operating the device are part of an application for operating the device, the application running on the processor circuit.

In certain embodiments, the system further comprises: an application for operating the device, the application running on the processor circuit. The application for operating the device may include the instruction sets for operating the device.

In some embodiments, the artificial intelligence unit is further configured to: receive at least one extra information. In further embodiments, the at least one extra information include one or more of: a time information, a location information, a computed information, an observed information, a sensory information, or a contextual information. In further embodiments, the at least one extra information include one or more of: an information on a digital picture, an information on an object in the digital picture, an information on the device's visual surrounding, an information on an instruction set, an information on an application, an information on an object of the application, an information on the processor circuit, an information on the device, or an information on an user. In further embodiments, the artificial intelligence unit is further configured to: learn the first digital picture correlated with the at least one extra information. The learning the first digital picture correlated with at least one extra information may include correlating the first digital picture with the at least one extra information. The learning the first digital picture correlated with at least one extra information may include storing the first digital picture correlated with the at least one extra information into the memory unit. In further embodiments, the anticipating the one or more instruction sets for operating the device correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture includes anticipating the one or more instruction sets for operating the device correlated with the first digital picture based on at least a partial match between an extra information correlated with the new digital picture and an extra information correlated with the first digital picture. The anticipating the one or more instruction sets for operating the device correlated with the first digital picture based on at least a partial match between an extra information correlated with the new digital picture and an extra information correlated with the first digital picture may include comparing an extra information correlated with the new digital picture and an extra information correlated with the first digital picture. The anticipating the one or more instruction sets for operating the device correlated with the first digital picture based on at least a partial match between an extra information correlated with the new digital picture and an extra information correlated with the first digital picture may include determining that a similarity between an extra information correlated with the new digital picture and an extra information correlated with the first digital picture exceeds a similarity threshold.

In some embodiments, the system further comprises: a user interface, wherein the artificial intelligence unit is further configured to: present, via the user interface, a user with an option to execute the one or more instruction sets for operating the device correlated with the first digital picture.

In certain embodiments, the system further comprises: a user interface, wherein the artificial intelligence unit is further configured to: receive, via the user interface, a user's selection to execute the one or more instruction sets for operating the device correlated with the first digital picture.

In some embodiments, the artificial intelligence unit is further configured to: rate the executed one or more instruction sets for operating the device correlated with the first digital picture. The rating the executed one or more instruction sets for operating the device correlated with the first digital picture may include displaying, on a display, the executed one or more instruction sets for operating the device correlated with the first digital picture along with one or more rating values as options to be selected by a user. The rating the executed one or more instruction sets for operating the device correlated with the first digital picture may include rating the executed one or more instruction sets for operating the device correlated with the first digital picture without a user input. The rating the executed one or more instruction sets for operating the device correlated with the first digital picture may include associating one or more rating values with the executed one or more instruction sets for operating the device correlated with the first digital picture and storing the one or more rating values into the memory unit.

In certain embodiments, the system further comprises: a user interface, wherein the artificial intelligence unit is further configured to: present, via the user interface, a user with an option to cancel the execution of the executed one or more instruction sets for operating the device correlated with the first digital picture. In further embodiments, the canceling the execution of the executed one or more instruction sets for operating the device correlated with the first digital picture includes restoring the processor circuit or the device to a prior state. The restoring the processor circuit or the device to a prior state may include saving the state of the processor circuit or the device prior to executing the one or more instruction sets for operating the device correlated with the first digital picture.

In some embodiments, the system further comprises: an input device configured to receive a user's operating directions, the user's operating directions for instructing the processor circuit on how to operate the device.

In certain embodiments, the autonomous device operating includes a partially or a fully autonomous device operating. The partially autonomous device operating may include executing the one or more instruction sets for operating the device correlated with the first digital picture responsive to a user confirmation. The fully autonomous device operating may include executing the one or more instruction sets for operating the device correlated with the first digital picture without a user confirmation.

In some embodiments, the artificial intelligence unit is further configured to: receive a second digital picture from the picture capturing apparatus; receive additional one or more instruction sets for operating the device from the processor circuit; and learn the second digital picture cor-

related with the additional one or more instruction sets for operating the device. In further embodiments, the second digital picture includes a second stream of digital pictures. In further embodiments, the learning the first digital picture correlated with the one or more instruction sets for operating the device and the learning the second digital picture correlated with the additional one or more instruction sets for operating the device include creating a connection between the first digital picture correlated with the one or more instruction sets for operating the device and the second digital picture correlated with the additional one or more instruction sets for operating the device. The connection may include or is associated with at least one of: an occurrence count, a weight, a parameter, or a data. In further embodiments, the learning the first digital picture correlated with the one or more instruction sets for operating the device and the learning the second digital picture correlated with the additional one or more instruction sets for operating the device include updating a connection between the first digital picture correlated with the one or more instruction sets for operating the device and the second digital picture correlated with the additional one or more instruction sets for operating the device. The updating the connection between the first digital picture correlated with the one or more instruction sets for operating the device and the second digital picture correlated with the additional one or more instruction sets for operating the device may include updating at least one of: an occurrence count, a weight, a parameter, or a data included in or associated with the connection. In further embodiments, the learning the first digital picture correlated with the one or more instruction sets for operating the device includes storing the first digital picture correlated with the one or more instruction sets for operating the device into a first node of a data structure, and wherein the learning the second digital picture correlated with the additional one or more instruction sets for operating the device includes storing the second digital picture correlated with the additional one or more instruction sets for operating the device into a second node of the data structure. The data structure may include a neural network, a graph, a collection of sequences, a sequence, a collection of knowledge cells, a knowledgebase, or a knowledge structure. The learning the first digital picture correlated with the one or more instruction sets for operating the device and the learning the second digital picture correlated with the additional one or more instruction sets for operating the device may include creating a connection between the first node and the second node. The learning the first digital picture correlated with the one or more instruction sets for operating the device and the learning the second digital picture correlated with the additional one or more instruction sets for operating the device may include updating a connection between the first node and the second node. In further embodiments, the first digital picture correlated with the one or more instruction sets for operating the device is stored into a first node of a neural network and the second digital picture correlated with the additional one or more instruction sets for operating the device is stored into a second node of the neural network. The first node and the second node may be connected by a connection. The first node may be part of a first layer of the neural network and the second node may be part of a second layer of the neural network. In further embodiments, the first digital picture correlated with the one or more instruction sets for operating the device is stored into a first node of a graph and the second digital picture correlated with the additional one or more instruction sets for operating the device is stored into a second node of the graph. The first node and the second node may be connected by a connection. In further embodiments, the first digital picture correlated with the one or more instruction sets for operating the device is stored into a first node of a sequence and the second digital picture correlated with the additional one or more instruction sets for operating the device is stored into a second node of the sequence.

In some aspects, the disclosure relates to a non-transitory computer storage medium having a computer program stored thereon, the program including instructions that when executed by one or more processor circuits cause the one or more processor circuits to perform operations comprising: receiving a first digital picture from a picture capturing apparatus. The operations may further include receiving one or more instruction sets for operating a device. The operations may further include learning the first digital picture correlated with the one or more instruction sets for operating the device. The operations may further include receiving a new digital picture from the picture capturing apparatus. The operations may further include anticipating the one or more instruction sets for operating the device correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture. The operations may further include causing an execution of the one or more instruction sets for operating the device correlated with the first digital picture, the causing performed in response to the anticipating the one or more instruction sets for operating the device correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture, wherein the device performs one or more operations defined by the one or more instruction sets for operating the device correlated with the first digital picture, the one or more operations performed in response to the executing.

In some aspects, the disclosure relates to a method comprising: (a) receiving a first digital picture from a picture capturing apparatus by one or more processor circuits. The method may further include (b) receiving one or more instruction sets for operating a device by the one or more processor circuits. The method may further include (c) learning the first digital picture correlated with the one or more instruction sets for operating the device, the learning of (c) performed by the one or more processor circuits. The method may further include (d) receiving a new digital picture from the picture capturing apparatus by the one or more processor circuits. The method may further include (e) anticipating the one or more instruction sets for operating the device correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture, the anticipating of (e) performed by the one or more processor circuits. The method may further include (f) executing the one or more instruction sets for operating the device correlated with the first digital picture, the executing of (f) performed in response to the anticipating of (e). The method may further include (g) performing, by the device, one or more operations defined by the one or more instruction sets for operating the device correlated with the first digital picture, the one or more operations performed in response to the executing of (f).

The operations or steps of the non-transitory computer storage medium and/or the method may be performed by any of the elements of the above described systems as applicable. The non-transitory computer storage medium and/or the method may include any of the operations, steps, and embodiments of the above described systems as applicable as well as the following embodiments.

In certain embodiments, the device includes one or more devices. In further embodiments, the device includes a smartphone, a fixture, a control device, a computing enabled device, or a computer. In further embodiments, the picture capturing apparatus includes one or more picture capturing apparatuses. In further embodiments, the picture capturing apparatus includes a motion picture camera or a still picture camera. In further embodiments, the picture capturing apparatus resides on a remote device, the remote device coupled to the one or more processor circuits via a network.

In some embodiments, the one or more instruction sets for operating the device include one or more instruction sets that temporally correspond to the first digital picture. The one or more instruction sets that temporally correspond to the first digital picture may include one or more instruction sets executed at a time of the capturing the first digital picture. The one or more instruction sets that temporally correspond to the first digital picture may include one or more instruction sets executed prior to the capturing the first digital picture. The one or more instruction sets that temporally correspond to the first digital picture may include one or more instruction sets executed within a threshold period of time prior to the capturing the first digital picture. The one or more instruction sets that temporally correspond to the first digital picture may include one or more instruction sets executed subsequent to the capturing the first digital picture. The one or more instruction sets that temporally correspond to the first digital picture may include one or more instruction sets executed within a threshold period of time subsequent to the capturing the first digital picture. The one or more instruction sets that temporally correspond to the first digital picture may include one or more instruction sets executed within a threshold period of time prior to the capturing the first digital picture or a threshold period of time subsequent to the capturing the first digital picture. The one or more instruction sets that temporally correspond to the first digital picture may include one or more instruction sets executed from a start of capturing a preceding digital picture to a start of capturing the first digital picture. The one or more instruction sets that temporally correspond to the first digital picture may include one or more instruction sets executed from a start of capturing the first digital picture to a start of capturing a subsequent digital picture. The one or more instruction sets that temporally correspond to the first digital picture may include one or more instruction sets executed from a completion of capturing a preceding digital picture to a completion of capturing the first digital picture. The one or more instruction sets that temporally correspond to the first digital picture may include one or more instruction sets executed from a completion of capturing the first digital picture to a completion of capturing a subsequent digital picture.

In certain embodiments, the one or more instruction sets for operating the device are executed by a processor circuit. In further embodiments, the one or more instruction sets for operating the device are part of an application for operating the device. In further embodiments, the one or more instruction sets for operating the device include one or more inputs into or one or more outputs from a processor circuit. In further embodiments, the one or more instruction sets for operating the device include values or states of one or more registers or elements of a processor circuit. In further embodiments, an instruction set includes at least one of: a command, a keyword, a symbol, an instruction, an operator, a variable, a value, an object, a data structure, a function, a parameter, a state, a signal, an input, an output, a character, a digit, or a reference thereto. In further embodiments, the one or more instruction sets include a source code, a bytecode, an intermediate code, a compiled code, an interpreted code, a translated code, a runtime code, an assembly code, a structured query language (SQL) code, or a machine code. In further embodiments, the one or more instruction sets include one or more code segments, lines of code, statements, instructions, functions, routines, subroutines, or basic blocks. In further embodiments, the one or more instruction sets for operating the device include one or more inputs into a logic circuit. In further embodiments, the one or more instruction sets for operating the device include one or more outputs from a logic circuit. In further embodiments, the one or more instruction sets for operating the device include one or more instruction sets for operating an application or an object of the application.

In some embodiments, the receiving the one or more instruction sets for operating the device includes obtaining the one or more instruction sets. In further embodiments, the receiving the one or more instruction sets for operating the device includes receiving the one or more instruction sets as they are executed. In further embodiments, the receiving the one or more instruction sets for operating the device includes receiving the one or more instruction sets for operating the device from a register or an element of a processor circuit. In further embodiments, the receiving the one or more instruction sets for operating the device includes receiving the one or more instruction sets for operating the device from an element that is part of, operating on, or coupled to a processor circuit. In further embodiments, the receiving the one or more instruction sets for operating the device includes receiving the one or more instruction sets for operating the device from at least one of: a memory unit, the device, a virtual machine, a runtime engine, a hard drive, a storage device, a peripheral device, a network connected device, or a user. In further embodiments, the receiving the one or more instruction sets for operating the device includes receiving the one or more instruction sets from a plurality of processor circuits, applications, memory units, devices, virtual machines, runtime engines, hard drives, storage devices, peripheral devices, network connected devices, or users.

In certain embodiments, the receiving the one or more instruction sets for operating the device includes receiving the one or more instruction sets for operating the device from a logic circuit. The logic circuit may include a microcontroller. The receiving the one or more instruction sets for operating the device from the logic circuit may include receiving the one or more instruction sets for operating the device from an element of the logic circuit. The receiving the one or more instruction sets for operating the device from the logic circuit may include receiving one or more inputs into the logic circuit. The receiving the one or more instruction sets for operating the device from the logic circuit may include receiving one or more outputs from the logic circuit.

In some embodiments, the receiving the one or more instruction sets for operating the device includes receiving the one or more instruction sets for operating the device from an application for operating the device. In further embodiments, the receiving the one or more instruction sets for operating the device includes receiving the one or more instruction sets for operating the device from an application, the application including instruction sets for operating the device. In further embodiments, the receiving the one or more instruction sets for operating the device includes receiving the one or more instruction sets at a source code write time, a compile time, an interpretation time, a translation time, a linking time, a loading time, or a runtime. In

further embodiments, the receiving the one or more instruction sets for operating the device includes at least one of: tracing, profiling, or instrumentation of a source code, a bytecode, an intermediate code, a compiled code, an interpreted code, a translated code, a runtime code, an assembly code, a structured query language (SQL) code, or a machine code. In further embodiments, the receiving the one or more instruction sets for operating the device includes at least one of: tracing, profiling, or instrumentation of an element that is part of, operating on, or coupled to a processor circuit. In further embodiments, the receiving the one or more instruction sets for operating the device includes at least one of: tracing, profiling, or instrumentation of a register of a processor circuit, a memory unit, a storage, or a repository where the one or more instruction sets for operating the device are stored. In further embodiments, the receiving the one or more instruction sets for operating the device includes at least one of: tracing, profiling, or instrumentation of a processor circuit, the device, a virtual machine, a runtime engine, an operating system, an execution stack, a program counter, or a processing element. In further embodiments, the receiving the one or more instruction sets for operating the device includes at least one of: tracing, profiling, or instrumentation of a processor circuit or tracing, profiling, or instrumentation of a component of the processor circuit. In further embodiments, the receiving the one or more instruction sets for operating the device includes at least one of: tracing, profiling, or instrumentation of an application or an object of the application. In further embodiments, the receiving the one or more instruction sets for operating the device includes at least one of: tracing, profiling, or instrumentation at a source code write time, a compile time, an interpretation time, a translation time, a linking time, a loading time, or a runtime. In further embodiments, the receiving the one or more instruction sets for operating the device includes at least one of: tracing, profiling, or instrumentation of one or more of code segments, lines of code, statements, instructions, functions, routines, subroutines, or basic blocks. In further embodiments, the receiving the one or more instruction sets for operating the device includes at least one of: tracing, profiling, or instrumentation of a user input. In further embodiments, the receiving the one or more instruction sets for operating the device includes at least one of: a manual, an automatic, a dynamic, or a just in time (JIT) tracing, profiling, or instrumentation. In further embodiments, the receiving the one or more instruction sets for operating the device includes utilizing at least one of: a .NET tool, a .NET application programming interface (API), a Java tool, a Java API, a logging tool, or an independent tool for obtaining instruction sets. In further embodiments, the receiving the one or more instruction sets for operating the device includes utilizing an assembly language. In further embodiments, the receiving the one or more instruction sets for operating the device includes utilizing a branch or a jump. In further embodiments, the receiving the one or more instruction sets for operating the device includes a branch tracing or a simulation tracing. In further embodiments, the receiving the one or more instruction sets for operating the device includes receiving the one or more instruction sets for operating the device by an interface. The interface may include an acquisition interface.

In certain embodiments, the first digital picture correlated with the one or more instruction sets for operating the device includes a unit of knowledge of how the device operated in a visual surrounding. In further embodiments, the first digital picture correlated with the one or more instruction sets for operating the device is included in a neuron, a node, a vertex, or an element of a data structure. The data structure may include a neural network, a graph, a collection of sequences, a sequence, a collection of knowledge cells, a knowledgebase, or a knowledge structure. Some of the neurons, nodes, vertices, or elements may be interconnected. In further embodiments, the first digital picture correlated with the one or more instruction sets for operating the device is structured into a knowledge cell. In further embodiments, the knowledge cell includes a unit of knowledge of how the device operated in a visual surrounding. In further embodiments, the knowledge cell is included in a neuron, a node, a vertex, or an element of a data structure. The data structure may include a neural network, a graph, a collection of sequences, a sequence, a collection of knowledge cells, a knowledgebase, or a knowledge structure. Some of the neurons, nodes, vertices, or elements may be interconnected.

In certain embodiments, the learning the first digital picture correlated with the one or more instruction sets for operating the device includes correlating the first digital picture with the one or more instruction sets for operating the device. The correlating the first digital picture with the one or more instruction sets for operating the device may include generating a knowledge cell, the knowledge cell comprising the first digital picture correlated with the one or more instruction sets for operating the device. The correlating the first digital picture with the one or more instruction sets for operating the device may include structuring a unit of knowledge of how the device operated in a visual surrounding. In further embodiments, the learning the first digital picture correlated with the one or more instruction sets for operating the device includes learning a user's knowledge, style, or methodology of operating the device in a visual surrounding. In further embodiments, the learning the first digital picture correlated with the one or more instruction sets for operating the device includes spontaneous learning the first digital picture correlated with the one or more instruction sets for operating the device.

In some embodiments, the learning the first digital picture correlated with the one or more instruction sets for operating the device includes storing, into a memory unit, the first digital picture correlated with the one or more instruction sets for operating the device, the first digital picture correlated with the one or more instruction sets for operating the device being part of a stored plurality of digital pictures correlated with one or more instruction sets for operating the device. In further embodiments, the memory unit includes one or more memory units. In further embodiments, the memory unit resides on a remote computing device, the remote computing device coupled to the one or more processor circuits via a network. The remote computing device may include a server. In further embodiments, the plurality of digital pictures correlated with one or more instruction sets for operating the device include a neural network, a graph, a collection of sequences, a sequence, a collection of knowledge cells, a knowledgebase, a knowledge structure, or a data structure. In further embodiments, the plurality of digital pictures correlated with one or more instruction sets for operating the device are organized into a neural network, a graph, a collection of sequences, a sequence, a collection of knowledge cells, a knowledgebase, a knowledge structure, or a data structure. In further embodiments, each of the plurality of digital pictures correlated with one or more instruction sets for operating the device is included in a neuron, a node, a vertex, or an element of a data structure. The data structure may include a neural network, a graph, a collection of sequences, a sequence, a collection of knowl-

edge cells, a knowledgebase, or a knowledge structure. Some of the neurons, nodes, vertices, or elements may be interconnected. In further embodiments, the plurality of digital pictures correlated with one or more instruction sets for operating the device include a user's knowledge, style, or methodology of operating the device in visual surroundings. In further embodiments, the plurality of digital pictures correlated with one or more instruction sets for operating the device are stored on a remote computing device. In further embodiments, the plurality of digital pictures correlated with one or more instruction sets for operating the device include an artificial intelligence system for knowledge structuring, storing, or representation. The artificial intelligence system for knowledge structuring, storing, or representation may include at least one of: a deep learning system, a supervised learning system, an unsupervised learning system, a neural network, a search-based system, an optimization-based system, a logic-based system, a fuzzy logic-based system, a tree-based system, a graph-based system, a hierarchical system, a symbolic system, a sub-symbolic system, an evolutionary system, a genetic system, a multi-agent system, a deterministic system, a probabilistic system, or a statistical system.

In some embodiments, the anticipating the one or more instruction sets for operating the device correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture includes comparing at least one portion of the new digital picture with at least one portion of the first digital picture. The at least one portion of the new digital picture may include at least one region, at least one feature, or at least one pixel of the new digital picture. The at least one portion of the first digital picture may include at least one region, at least one feature, or at least one pixel of the first digital picture. The comparing the at least one portion of the new digital picture with the at least one portion of the first digital picture may include comparing at least one region of the new digital picture with at least one region of the first digital picture. The comparing the at least one portion of the new digital picture with the at least one portion of the first digital picture may include comparing at least one feature of the new digital picture with at least one feature of the first digital picture. The comparing the at least one portion of the new digital picture with the at least one portion of the first digital picture may include comparing at least one pixel of the new digital picture with at least one pixel of the first digital picture. The comparing the at least one portion of the new digital picture with the at least one portion of the first digital picture may include at least one of: performing a color adjustment, performing a size adjustment, performing a content manipulation, utilizing a transparency, or utilizing a mask on the new or the first digital picture. The comparing the at least one portion of the new digital picture with the at least one portion of the first digital picture may include recognizing at least one person or object in the new digital picture and at least one person or object in the first digital picture, and comparing the at least one person or object from the new digital picture with the at least one person or object from the first digital picture.

In certain embodiments, the anticipating the one or more instruction sets for operating the device correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture includes determining that there is at least a partial match between the new digital picture and the first digital picture. In further embodiments, the determining that there is at least a partial match between the new digital picture and the first digital picture includes determining that there is at least a partial match between one or more portions of the new digital picture and one or more portions of the first digital picture. In further embodiments, the determining that there is at least a partial match between the new digital picture and the first digital picture includes determining that a similarity between at least one portion of the new digital picture and at least one portion of the first digital picture exceeds a similarity threshold. In further embodiments, the determining that there is at least a partial match between the new digital picture and the first digital picture includes determining a substantial similarity between at least one portion of the new digital picture and at least one portion of the first digital picture. The at least one portion of the new digital picture may include at least one region, at least one feature, or at least one pixel of the new digital picture. The at least one portion of the first digital picture may include at least one region, at least one feature, or at least one pixel of the first digital picture. The substantial similarity may be achieved when a similarity between the at least one portion of the new digital picture and the at least one portion of the first digital picture exceeds a similarity threshold. The substantial similarity may be achieved when a number or a percentage of matching or partially matching regions from the new digital picture and from the first digital picture exceeds a threshold number or threshold percentage. The substantial similarity may be achieved when a number or a percentage of matching or partially matching features from the new digital picture and from the first digital picture exceeds a threshold number or threshold percentage. The substantial similarity may be achieved when a number or a percentage of matching or partially matching pixels from the new digital picture and from the first digital picture exceeds a threshold number or threshold percentage. The substantial similarity may be achieved when one or more same or similar objects are recognized in the new digital picture and the first digital picture. In further embodiments, the determining that there is at least a partial match between the new digital picture and the first digital picture includes determining that a number or a percentage of matching regions from the new digital picture and from the first digital picture exceeds a threshold number or threshold percentage. The matching regions from the new digital picture and from the first digital picture may be determined factoring in at least one of: a location of a region, an importance of a region, a threshold for a similarity in a region, or a threshold for a difference in a region. In further embodiments, the determining that there is at least a partial match between the new digital picture and the first digital picture includes determining that a number or a percentage of matching features from the new digital picture and from the first digital picture exceeds a threshold number or threshold percentage. The matching features from the new digital picture and from the first digital picture may be determined factoring in at least one of: a type of a feature, an importance of a feature, a location of a feature, a threshold for a similarity in a feature, or a threshold for a difference in a feature. In further embodiments, the determining that there is at least a partial match between the new digital picture and the first digital picture includes determining that a number or a percentage of matching pixels from the new digital picture and from the first digital picture exceeds a threshold number or threshold percentage. The matching pixels from the new digital picture and from the first digital picture may be determined factoring in at least one of: a location of a pixel, a threshold for a similarity in a pixel, or a threshold for a difference in a pixel. In further embodiments, the determining that there is at least a partial

match between the new digital picture and the first digital picture includes recognizing a same person or object in the new and the first digital pictures.

In some embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes executing the one or more instruction sets for operating the device correlated with the first digital picture instead of or prior to an instruction set that would have been executed next. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes modifying one or more instruction sets. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes modifying a register or an element of a processor circuit. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes inserting the one or more instruction sets for operating the device correlated with the first digital picture into a register or an element of a processor circuit. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes redirecting a processor circuit to the one or more instruction sets for operating the device correlated with the first digital picture. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes redirecting a processor circuit to one or more alternate instruction sets, the alternate instruction sets comprising the one or more instruction sets for operating the device correlated with the first digital picture. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes transmitting, to a processor circuit for execution, the one or more instruction sets for operating the device correlated with the first digital picture. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes issuing an interrupt to a processor circuit and executing the one or more instruction sets for operating the device correlated with the first digital picture following the interrupt. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes modifying an element that is part of, operating on, or coupled to a processor circuit.

In certain embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes executing, by a logic circuit, the one or more instruction sets for operating the device correlated with the first digital picture. The logic circuit may include a microcontroller. The executing, by the logic circuit, the one or more instruction sets for operating the device correlated with the first digital picture may include modifying an element of the logic circuit. The executing, by the logic circuit, the one or more instruction sets for operating the device correlated with the first digital picture may include inserting the one or more instruction sets for operating the device correlated with the first digital picture into an element of the logic circuit. The executing, by the logic circuit, the one or more instruction sets for operating the device correlated with the first digital picture may include redirecting the logic circuit to the one or more instruction sets for operating the device correlated with the first digital picture. The executing, by the logic circuit, the one or more instruction sets for operating the device correlated with the first digital picture may include replacing inputs into the logic circuit with the one or more instruction sets for operating the device correlated with the first digital picture. The executing, by the logic circuit, the one or more instruction sets for operating the device correlated with the first digital picture may include replacing outputs from the logic circuit with the one or more instruction sets for operating the device correlated with the first digital picture.

In some embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes executing, by an application for operating the device, the one or more instruction sets for operating the device correlated with the first digital picture. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes modifying an application, the application including instruction sets for operating the device. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes redirecting an application to the one or more instruction sets for operating the device correlated with the first digital picture. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes redirecting an application to one or more alternate instruction sets, the alternate instruction sets comprising the one or more instruction sets for operating the device correlated with the first digital picture. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes modifying one or more instruction sets of an application. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes modifying a source code, a bytecode, an intermediate code, a compiled code, an interpreted code, a translated code, a runtime code, an assembly code, or a machine code. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes modifying at least one of: a memory unit, a register of a processor circuit, a storage, or a repository where instruction sets are stored or used. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes modifying one or more instruction sets for operating an application or an object of the application. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes modifying at least one of: an element of a processor circuit, an element of the device, a virtual machine, a runtime engine, an operating system, an execution stack, a program counter, or a user input. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes modifying one or more instruction sets at a source code write time, a compile time, an interpretation time, a translation time, a linking time, a loading time, or a runtime. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes modifying one or more code segments, lines of code, statements, instructions, functions, routines, subroutines, or basic blocks. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes a manual, an automatic, a dynamic, or a just in time (JIT) instrumentation of an application. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes utilizing one or more of

a .NET tool, a .NET application programming interface (API), a Java tool, a Java API, an operating system tool, or an independent tool for modifying instruction sets. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes utilizing at least one of: a dynamic, an interpreted, or a scripting programming language. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes utilizing at least one of: a dynamic code, a dynamic class loading, or a reflection. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes utilizing an assembly language. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes utilizing at least one of: a metaprogramming, a self-modifying code, or an instruction set modification tool. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes utilizing at least one of: just in time (JIT) compiling, JIT interpretation, JIT translation, dynamic recompiling, or binary rewriting. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes utilizing at least one of: a dynamic expression creation, a dynamic expression execution, a dynamic function creation, or a dynamic function execution. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes adding or inserting additional code into a code of an application. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes at least one of: modifying, removing, rewriting, or overwriting a code of an application. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes at least one of: branching, redirecting, extending, or hot swapping a code of an application. The branching or redirecting the code may include inserting at least one of: a branch, a jump, or a means for redirecting an execution. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes implementing a user's knowledge, style, or methodology of operating the device in a visual surrounding. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first digital picture includes executing the one or more instruction sets for operating the device correlated with the first digital picture via an interface. The interface may include a modification interface.

In certain embodiments, the one or more operations defined by the one or more instruction sets for operating the device correlated with the first digital picture include at least one of: an operation with or by a smartphone, an operation with or by a fixture, an operation with or by a control device, or an operation with or by a computer or computing enabled device. In further embodiments, the performing the one or more operations defined by the one or more instruction sets for operating the device correlated with the first digital picture includes implementing a user's knowledge, style, or methodology of operating the device in a visual surrounding.

In some embodiments, the instruction sets for operating the device are part of an application for operating the device.

In certain embodiments, the operations of the non-transitory computer storage medium and/or the method further comprise: receiving at least one extra information. In further embodiments, the at least one extra information include one or more of: a time information, a location information, a computed information, an observed information, a sensory information, or a contextual information. In further embodiments, the at least one extra information include one or more of: an information on a digital picture, an information on an object in the digital picture, an information on the device's visual surrounding, an information on an instruction set, an information on an application, an information on an object of the application, an information on a processor circuit, an information on the device, or an information on an user. In further embodiments, the operations of the non-transitory computer storage medium and/or the method further comprise: learning the first digital picture correlated with the at least one extra information. The learning the first digital picture correlated with at least one extra information may include correlating the first digital picture with the at least one extra information. The learning the first digital picture correlated with at least one extra information may include storing the first digital picture correlated with the at least one extra information into a memory unit. In further embodiments, the anticipating the one or more instruction sets for operating the device correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture includes anticipating the one or more instruction sets for operating the device correlated with the first digital picture based on at least a partial match between an extra information correlated with the new digital picture and an extra information correlated with the first digital picture. The anticipating the one or more instruction sets for operating the device correlated with the first digital picture based on at least a partial match between an extra information correlated with the new digital picture and an extra information correlated with the first digital picture may include comparing an extra information correlated with the new digital picture and an extra information correlated with the first digital picture. The anticipating the one or more instruction sets for operating the device correlated with the first digital picture based on at least a partial match between an extra information correlated with the new digital picture and an extra information correlated with the first digital picture may include determining that a similarity between an extra information correlated with the new digital picture and an extra information correlated with the first digital picture exceeds a similarity threshold.

In some embodiments, the operations of the non-transitory computer storage medium and/or the method further comprise: presenting, via a user interface, a user with an option to execute the one or more instruction sets for operating the device correlated with the first digital picture.

In certain embodiments, the operations of the non-transitory computer storage medium and/or the method further comprise: receiving, via a user interface, a user's selection to execute the one or more instruction sets for operating the device correlated with the first digital picture.

In some embodiments, the operations of the non-transitory computer storage medium and/or the method further comprise: rating the executed one or more instruction sets for operating the device correlated with the first digital picture. The rating the executed one or more instruction sets for operating the device correlated with the first digital picture may include displaying, on a display, the executed one or more instruction sets for operating the device correlated with the first digital picture along with one or more

rating values as options to be selected by a user. The rating the executed one or more instruction sets for operating the device correlated with the first digital picture may include rating the executed one or more instruction sets for operating the device correlated with the first digital picture without a user input. The rating the executed one or more instruction sets for operating the device correlated with the first digital picture may include associating one or more rating values with the executed one or more instruction sets for operating the device correlated with the first digital picture and storing the one or more rating values into a memory unit.

In certain embodiments, the operations of the non-transitory computer storage medium and/or the method further comprise: presenting, via a user interface, a user with an option to cancel the execution of the executed one or more instruction sets for operating the device correlated with the first digital picture. In further embodiments, the canceling the execution of the executed one or more instruction sets for operating the device correlated with the first digital picture includes restoring a processor circuit or the device to a prior state. The restoring the processor circuit or the device to a prior state may include saving the state of the processor circuit or the device prior to executing the one or more instruction sets for operating the device correlated with the first digital picture.

In some embodiments, the operations of the non-transitory computer storage medium and/or the method further comprise: receiving, via an input device, a user's operating directions, the user's operating directions for instructing a processor circuit on how to operate the device.

In certain embodiments, the operations of the non-transitory computer storage medium and/or the method further comprise: receiving a second digital picture from the picture capturing apparatus; receiving additional one or more instruction sets for operating the device; and learning the second digital picture correlated with the additional one or more instruction sets for operating the device. In further embodiments, the second digital picture includes a second stream of digital pictures. In further embodiments, the learning the first digital picture correlated with the one or more instruction sets for operating the device and the learning the second digital picture correlated with the additional one or more instruction sets for operating the device include creating a connection between the first digital picture correlated with the one or more instruction sets for operating the device and the second digital picture correlated with the additional one or more instruction sets for operating the device. The connection may include or is associated with at least one of: an occurrence count, a weight, a parameter, or a data. In further embodiments, the learning the first digital picture correlated with the one or more instruction sets for operating the device and the learning the second digital picture correlated with the additional one or more instruction sets for operating the device include updating a connection between the first digital picture correlated with the one or more instruction sets for operating the device and the second digital picture correlated with the additional one or more instruction sets for operating the device. The updating the connection between the first digital picture correlated with the one or more instruction sets for operating the device and the second digital picture correlated with the additional one or more instruction sets for operating the device may include updating at least one of: an occurrence count, a weight, a parameter, or a data included in or associated with the connection. In further embodiments, the learning the first digital picture correlated with the one or more instruction sets for operating the device includes storing the first digital picture correlated with the one or more instruction sets for operating the device into a first node of a data structure, and wherein the learning the second digital picture correlated with the additional one or more instruction sets for operating the device may include storing the second digital picture correlated with the additional one or more instruction sets for operating the device into a second node of the data structure. The data structure may include a neural network, a graph, a collection of sequences, a sequence, a collection of knowledge cells, a knowledge-base, or a knowledge structure. The learning the first digital picture correlated with the one or more instruction sets for operating the device and the learning the second digital picture correlated with the additional one or more instruction sets for operating the device may include creating a connection between the first node and the second node. The learning the first digital picture correlated with the one or more instruction sets for operating the device and the learning the second digital picture correlated with the additional one or more instruction sets for operating the device may include updating a connection between the first node and the second node. In further embodiments, the first digital picture correlated with the one or more instruction sets for operating the device is stored into a first node of a neural network and the second digital picture correlated with the additional one or more instruction sets for operating the device is stored into a second node of the neural network. The first node and the second node may be connected by a connection. The first node may be part of a first layer of the neural network and the second node may be part of a second layer of the neural network. In further embodiments, the first digital picture correlated with the one or more instruction sets for operating the device is stored into a first node of a graph and the second digital picture correlated with the additional one or more instruction sets for operating the device is stored into a second node of the graph. The first node and the second node may be connected by a connection. In further embodiments, the first digital picture correlated with the one or more instruction sets for operating the device is stored into a first node of a sequence and the second digital picture correlated with the additional one or more instruction sets for operating the device is stored into a second node of the sequence.

In some aspects, the disclosure relates to a system for learning a visual surrounding for autonomous device operating. The system may be implemented at least in part on one or more computing devices. In some embodiments, the system comprises a processor circuit configured to execute instruction sets for operating a device. The system may further include a memory unit configured to store data. The system may further include a picture capturing apparatus configured to capture digital pictures. The system may further include an artificial intelligence unit. In some embodiments, the artificial intelligence unit may be configured to: receive a first digital picture from the picture capturing apparatus. The artificial intelligence unit may be further configured to: receive one or more instruction sets for operating the device from the processor circuit. The artificial intelligence unit may be further configured to: learn the first digital picture correlated with the one or more instruction sets for operating the device.

In some aspects, the disclosure relates to a non-transitory computer storage medium having a computer program stored thereon, the program including instructions that when executed by one or more processor circuits cause the one or more processor circuits to perform operations comprising: receiving a first digital picture from a picture capturing

apparatus. The operations may further include: receiving one or more instruction sets for operating a device. The operations may further include: learning the first digital picture correlated with the one or more instruction sets for operating the device.

In some aspects, the disclosure relates to a method comprising: (a) receiving a first digital picture from a picture capturing apparatus by one or more processor circuits. The method may further include: (b) receiving one or more instruction sets for operating a device by the one or more processor circuits. The method may further include: (c) learning the first digital picture correlated with the one or more instruction sets for operating the device, the learning of (c) performed by the one or more processor circuits.

The operations or steps of the non-transitory computer storage medium and/or the method may be performed by any of the elements of the above described systems as applicable. The non-transitory computer storage medium and/or the method may include any of the operations, steps, and embodiments of the above described systems as applicable.

In some aspects, the disclosure relates to a system for using a visual surrounding for autonomous device operating. The system may be implemented at least in part on one or more computing devices. In some embodiments, the system comprises a processor circuit configured to execute instruction sets for operating a device. The system may further include a memory unit configured to store data. The system may further include a picture capturing apparatus configured to capture digital pictures. The system may further include an artificial intelligence unit. In some embodiments, the artificial intelligence unit may be configured to: access the memory unit that stores a plurality of digital pictures correlated with one or more instruction sets for operating the device, the plurality including a first digital picture correlated with one or more instruction sets for operating the device. The artificial intelligence unit may be further configured to: receive a new digital picture from the picture capturing apparatus. The artificial intelligence unit may be further configured to: anticipate the one or more instruction sets for operating the device correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture. The artificial intelligence unit may be further configured to: cause the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture, the executing performed in response to the anticipating of the artificial intelligence unit, wherein the device performs one or more operations defined by the one or more instruction sets for operating the device correlated with the first digital picture, the one or more operations performed in response to the executing by the processor circuit.

In some aspects, the disclosure relates to a non-transitory computer storage medium having a computer program stored thereon, the program including instructions that when executed by one or more processor circuits cause the one or more processor circuits to perform operations comprising: accessing a memory unit that stores a plurality of digital pictures correlated with one or more instruction sets for operating a device, the plurality including a first digital picture correlated with one or more instruction sets for operating the device. The operations may further include: receiving a new digital picture from a picture capturing apparatus. The operations may further include: anticipating the one or more instruction sets for operating the device correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture. The operations may further include: causing an execution of the one or more instruction sets for operating the device correlated with the first digital picture, the causing performed in response to the anticipating the one or more instruction sets for operating the device correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture, wherein the device performs one or more operations defined by the one or more instruction sets for operating the device correlated with the first digital picture, the one or more operations performed in response to the executing.

In some aspects, the disclosure relates to a method comprising: (a) accessing a memory unit that stores a plurality of digital pictures correlated with one or more instruction sets for operating a device, the plurality including a first digital picture correlated with one or more instruction sets for operating the device, the accessing of (a) performed by the one or more processor circuits. The method may further include: (b) receiving a new digital picture from a picture capturing apparatus by the one or more processor circuits. The method may further include: (c) anticipating the one or more instruction sets for operating the device correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture, the anticipating of (c) performed by the one or more processor circuits. The method may further include: (d) executing the one or more instruction sets for operating the device correlated with the first digital picture, the executing of (d) performed in response to the anticipating of (c). The method may further include: (e) performing, by the device, one or more operations defined by the one or more instruction sets for operating the device correlated with the first digital picture, the one or more operations performed in response to the executing of (d).

The operations or steps of the non-transitory computer storage medium and/or the method may be performed by any of the elements of the above described systems as applicable. The non-transitory computer storage medium and/or the method may include any of the operations, steps, and embodiments of the above described systems as applicable.

In some aspects, the disclosure relates to a system for learning and using a visual surrounding for autonomous device operating. The system may be implemented at least in part on one or more computing devices. In some embodiments, the system comprises a processor circuit configured to execute instruction sets for operating a device. The system may further include a memory unit configured to store data. The system may further include a picture capturing apparatus configured to capture digital pictures. The system may further include an artificial intelligence. In some embodiments, the artificial intelligence unit may be configured to: receive a first stream of digital pictures from the picture capturing apparatus. The artificial intelligence unit may be further configured to: receive one or more instruction sets for operating the device from the processor circuit. The artificial intelligence unit may be further configured to: learn the first stream of digital pictures correlated with the one or more instruction sets for operating the device. The artificial intelligence unit may be further configured to: receive a new stream of digital pictures from the picture capturing apparatus. The artificial intelligence unit may be further configured to: anticipate the one or more instruction sets for operating the device correlated with the first stream of digital pictures based on at least a partial match between the new stream of digital pictures and the first stream of digital pictures. The artificial intelligence unit may be further

configured to: cause the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures, the executing performed in response to the anticipating of the artificial intelligence unit, wherein the device performs one or more operations defined by the one or more instruction sets for operating the device correlated with the first stream of digital pictures, the one or more operations performed in response to the executing by the processor circuit.

In certain embodiments, the first stream of digital pictures includes one or more digital pictures. In further embodiments, the new stream of digital pictures includes one or more digital pictures. In further embodiments, the first and the new streams of digital pictures portray the device's surrounding. In further embodiments, the first and the new streams of digital pictures portray a remote device's surrounding. In further embodiments, the first or the new stream of digital pictures includes a digital motion picture. The digital motion picture may include a MPEG motion picture, an AVI motion picture, a FLV motion picture, a MOV motion picture, a RM motion picture, a SWF motion picture, a WMV motion picture, a DivX motion picture, or a digitally encoded motion picture. In further embodiments, the first stream of digital pictures includes a comparative stream of digital pictures whose at least one portion can be used for comparisons with at least one portion of streams of digital pictures subsequent to the first stream of digital pictures, the streams of digital pictures subsequent to the first stream of digital pictures comprising the new stream of digital pictures. In further embodiments, the first stream of digital pictures includes a comparative stream of digital pictures that can be used for comparisons with the new stream of digital pictures. In further embodiments, the new stream of digital pictures includes an anticipatory stream of digital pictures whose correlated one or more instruction sets can be used for anticipation of one or more instruction sets to be executed by the processor circuit.

In some embodiments, the first stream of digital pictures correlated with the one or more instruction sets for operating the device includes a unit of knowledge of how the device operated in a visual surrounding. In further embodiments, the first stream of digital pictures correlated with the one or more instruction sets for operating the device is included in a neuron, a node, a vertex, or an element of a data structure. In further embodiments, the data structure includes a neural network, a graph, a collection of sequences, a sequence, a collection of knowledge cells, a knowledgebase, or a knowledge structure. Some of the neurons, nodes, vertices, or elements may be interconnected. In further embodiments, the first stream of digital pictures correlated with the one or more instruction sets for operating the device is structured into a knowledge cell. In further embodiments, the knowledge cell includes a unit of knowledge of how the device operated in a visual surrounding. In further embodiments, the knowledge cell is included in a neuron, a node, a vertex, or an element of a data structure. The data structure may include a neural network, a graph, a collection of sequences, a sequence, a collection of knowledge cells, a knowledgebase, or a knowledge structure. Some of the neurons, nodes, vertices, or elements may be interconnected.

In certain embodiments, the learning the first stream of digital pictures correlated with the one or more instruction sets for operating the device includes correlating the first stream of digital pictures with the one or more instruction sets for operating the device. The correlating the first stream of digital pictures with the one or more instruction sets for operating the device may include generating a knowledge cell, the knowledge cell comprising the first stream of digital pictures correlated with the one or more instruction sets for operating the device. The correlating the first stream of digital pictures with the one or more instruction sets for operating the device may include structuring a unit of knowledge of how the device operated in a visual surrounding. In further embodiments, the learning the first stream of digital pictures correlated with the one or more instruction sets for operating the device includes learning a user's knowledge, style, or methodology of operating the device in a visual surrounding. In further embodiments, the learning the first stream of digital pictures correlated with the one or more instruction sets for operating the device includes spontaneous learning the first stream of digital pictures correlated with the one or more instruction sets for operating the device.

In some embodiments, the learning the first stream of digital pictures correlated with the one or more instruction sets for operating the device includes storing, into the memory unit, the first stream of digital pictures correlated with the one or more instruction sets for operating the device, the first stream of digital pictures correlated with the one or more instruction sets for operating the device being part of a stored plurality of streams of digital pictures correlated with one or more instruction sets for operating the device. In further embodiments, the plurality of streams of digital pictures correlated with one or more instruction sets for operating the device include a neural network, a graph, a collection of sequences, a sequence, a collection of knowledge cells, a knowledgebase, a knowledge structure, or a data structure. In further embodiments, the plurality of streams of digital pictures correlated with one or more instruction sets for operating the device are organized into a neural network, a graph, a collection of sequences, a sequence, a collection of knowledge cells, a knowledgebase, a knowledge structure, or a data structure. In further embodiments, each of the plurality of streams of digital pictures correlated with one or more instruction sets for operating the device is included in a neuron, a node, a vertex, or an element of a data structure. The data structure may include a neural network, a graph, a collection of sequences, a sequence, a collection of knowledge cells, a knowledgebase, or a knowledge structure. Some of the neurons, nodes, vertices, or elements may be interconnected. In further embodiments, the plurality of streams of digital pictures correlated with one or more instruction sets for operating the device include a user's knowledge, style, or methodology of operating the device in visual surroundings. In further embodiments, the plurality of streams of digital pictures correlated with one or more instruction sets for operating the device are stored on a remote computing device. In further embodiments, the plurality of streams of digital pictures correlated with one or more instruction sets for operating the device include an artificial intelligence system for knowledge structuring, storing, or representation. The artificial intelligence system for knowledge structuring, storing, or representation may include at least one of: a deep learning system, a supervised learning system, an unsupervised learning system, a neural network, a search-based system, an optimization-based system, a logic-based system, a fuzzy logic-based system, a tree-based system, a graph-based system, a hierarchical system, a symbolic system, a sub-symbolic system, an evolutionary system, a genetic system, a multi-agent system, a deterministic system, a probabilistic system, or a statistical system.

In some embodiments, the anticipating the one or more instruction sets for operating the device correlated with the

first stream of digital pictures based on at least a partial match between the new stream of digital pictures and the first stream of digital pictures includes comparing at least one portion of the new stream of digital pictures with at least one portion of the first stream of digital pictures. The at least one portion of the new stream of digital pictures may include at least one digital picture, at least one region, at least one feature, or at least one pixel of the new stream of digital pictures. The at least one portion of the first stream of digital pictures may include at least one digital picture, at least one region, at least one feature, or at least one pixel of the first stream of digital pictures. The comparing the at least one portion of the new stream of digital pictures with the at least one portion of the first stream of digital pictures may include comparing at least one digital picture of the new stream of digital pictures with at least one digital picture of the first stream of digital pictures. The at least one portion of the new stream of digital pictures with the at least one portion of the first stream of digital pictures may include comparing at least one region of at least one digital picture of the new stream of digital pictures with at least one region of at least one digital picture of the first stream of digital pictures. The comparing the at least one portion of the new stream of digital pictures with the at least one portion of the first stream of digital pictures may include comparing at least one feature of at least one digital picture of the new stream of digital pictures with at least one feature of at least one digital picture of the first stream of digital pictures. The comparing the at least one portion of the new stream of digital pictures with the at least one portion of the first stream of digital pictures may include comparing at least one pixel of at least one digital picture of the new stream of digital pictures with at least one pixel of at least one digital picture of the first stream of digital pictures. The comparing the at least one portion of the new stream of digital pictures with the at least one portion of the first stream of digital pictures may include at least one of: performing a color adjustment, performing a size adjustment, performing a content manipulation, performing temporal alignment, performing dynamic time warping, utilizing a transparency, or utilizing a mask on the new or the first stream of digital pictures. The comparing the at least one portion of the new stream of digital pictures with the at least one portion of the first stream of digital pictures may include recognizing at least one person or object in the new stream of digital pictures and at least one person or object in the first stream of digital pictures, and comparing the at least one person or object from the new stream of digital pictures with the at least one person or object from the first stream of digital pictures.

In certain embodiments, the anticipating the one or more instruction sets for operating the device correlated with the first stream of digital pictures based on at least a partial match between the new stream of digital pictures and the first stream of digital pictures includes determining that there is at least a partial match between the new stream of digital pictures and the first stream of digital pictures. In further embodiments, the determining that there is at least a partial match between the new stream of digital pictures and the first stream of digital pictures includes determining that there is at least a partial match between one or more portions of the new stream of digital pictures and one or more portions of the first stream of digital pictures. In further embodiments, the determining that there is at least a partial match between the new stream of digital pictures and the first stream of digital pictures includes determining that a similarity between at least one portion of the new stream of digital pictures and at least one portion of the first stream of digital pictures exceeds a similarity threshold. In further embodiments, the determining that there is at least a partial match between the new stream of digital pictures and the first stream of digital pictures includes determining a substantial similarity between at least one portion of the new stream of digital pictures and at least one portion of the first stream of digital pictures. The at least one portion of the new stream of digital pictures may include at least one digital picture, at least one region, at least one feature, or at least one pixel of the new stream of digital pictures. The at least one portion of the first stream of digital pictures may include at least one digital picture, at least one region, at least one feature, or at least one pixel of the first stream of digital pictures. The substantial similarity may be achieved when a similarity between the at least one portion of the new stream of digital pictures and the at least one portion of the first stream of digital pictures exceeds a similarity threshold. The substantial similarity may be achieved when a number or a percentage of matching or partially matching digital pictures from the new stream of digital pictures and from the first stream of digital pictures exceeds a threshold number or threshold percentage. The substantial similarity may be achieved when a number or a percentage of matching or partially matching regions of at least one digital picture from the new stream of digital pictures and from the first stream of digital pictures exceeds a threshold number or threshold percentage. The substantial similarity may be achieved when a number or a percentage of matching or partially matching features of at least one digital picture from the new stream of digital pictures and from the first stream of digital pictures exceeds a threshold number or threshold percentage. The substantial similarity may be achieved when a number or a percentage of matching or partially matching pixels of at least one digital picture from the new stream of digital pictures and from the first stream of digital pictures exceeds a threshold number or threshold percentage. The substantial similarity may be achieved when one or more same or similar objects are recognized in the new stream of digital pictures and the first stream of digital pictures. In further embodiments, the determining that there is at least a partial match between the new stream of digital pictures and the first stream of digital pictures includes determining that a number or a percentage of matching digital pictures from the new stream of digital pictures and from the first stream of digital pictures exceeds a threshold number or threshold percentage. The matching digital pictures from the new stream of digital pictures and from the first stream of digital pictures may be determined factoring in at least one of: an order of a digital picture in a stream of digital pictures, an importance of a digital picture, a threshold for a similarity in a digital picture, or a threshold for a difference in a digital picture. In further embodiments, the determining that there is at least a partial match between the new stream of digital pictures and the first stream of digital pictures includes determining that a number or a percentage of matching regions from at least one digital picture of the new stream of digital pictures and from at least one digital picture of the first stream of digital pictures exceeds a threshold number or threshold percentage. The matching regions from at least one digital picture of the new stream of digital pictures and from at least one digital picture of the first stream of digital pictures may be determined factoring in at least one of: a location of a region, an importance of a region, a threshold for a similarity in a region, or a threshold for a difference in a region. In further embodiments, the determining that there is at least a partial match between the new stream of digital pictures and the first stream of digital pictures includes

determining that a number or a percentage of matching features from at least one digital picture of the new stream of digital pictures and from at least one digital picture of the first stream of digital pictures exceeds a threshold number or threshold percentage. The matching features from at least one digital picture of the new stream of digital pictures and from at least one digital picture of the first stream of digital pictures may be determined factoring in at least one of: a type of a feature, an importance of a feature, a location of a feature, a threshold for a similarity in a feature, or a threshold for a difference in a feature. In further embodiments, the determining that there is at least a partial match between the new stream of digital pictures and the first stream of digital pictures includes determining that a number or a percentage of matching pixels from at least one digital picture of the new stream of digital pictures and from at least one digital picture of the first stream of digital pictures exceeds a threshold number or threshold percentage. The matching pixels from at least one digital picture of the new stream of digital pictures and from at least one digital picture of the first stream of digital pictures may be determined factoring in at least one of: a location of a pixel, a threshold for a similarity in a pixel, or a threshold for a difference in a pixel. In further embodiments, the determining that there is at least a partial match between the new stream of digital pictures and the first stream of digital pictures includes recognizing a same person or object in the new and the first streams of digital pictures.

In certain embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures instead of or prior to an instruction set that would have been executed next. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes modifying one or more instruction sets of the processor circuit. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes modifying a register or an element of the processor circuit. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes inserting the one or more instruction sets for operating the device correlated with the first stream of digital pictures into a register or an element of the processor circuit. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes redirecting the processor circuit to the one or more instruction sets for operating the device correlated with the first stream of digital pictures. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes redirecting the processor circuit to one or more alternate instruction sets, the alternate instruction sets comprising the one or more instruction sets for operating the device correlated with the first stream of digital pictures. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes transmitting, to the processor circuit for execution, the one or more instruction sets for operating the device correlated with the first stream of digital pictures. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes issuing an interrupt to the processor circuit and executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures following the interrupt. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes modifying an element that is part of, operating on, or coupled to the processor circuit.

In some embodiments, the processor circuit includes a logic circuit, and wherein the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes causing the logic circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures. The logic circuit may include a microcontroller. The causing the logic circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures may include modifying an element of the logic circuit. The causing the logic circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures may include inserting the one or more instruction sets for operating the device correlated with the first stream of digital pictures into an element of the logic circuit. The causing the logic circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures may include redirecting the logic circuit to the one or more instruction sets for operating the device correlated with the first stream of digital pictures. The causing the logic circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures may include replacing inputs into the logic circuit with the one or more instruction sets for operating the device correlated with the first stream of digital pictures. The causing the logic circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures may include replacing outputs from the logic circuit with the one or more instruction sets for operating the device correlated with the first stream of digital pictures.

In certain embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes causing an application for operating the device to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures, the application running on the processor circuit.

In some embodiments, the system further comprises: an application including instruction sets for operating the device, the application running on the processor circuit, wherein the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes modifying the application.

In certain embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes redirecting an application to the one or more instruction sets for operating the device correlated with the first stream of digital pictures, the application running on the processor circuit. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of

digital pictures includes redirecting an application to one or more alternate instruction sets, the application running on the processor circuit, the alternate instruction sets comprising the one or more instruction sets for operating the device correlated with the first stream of digital pictures. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes modifying one or more instruction sets of an application, the application running on the processor circuit. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes modifying a source code, a bytecode, an intermediate code, a compiled code, an interpreted code, a translated code, a runtime code, an assembly code, or a machine code. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes modifying at least one of: the memory unit, a register of the processor circuit, a storage, or a repository where instruction sets are stored or used. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes modifying one or more instruction sets for operating an application or an object of the application, the application running on the processor circuit. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes modifying at least one of: an element of the processor circuit, an element of the device, a virtual machine, a runtime engine, an operating system, an execution stack, a program counter, or a user input. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes modifying one or more instruction sets at a source code write time, a compile time, an interpretation time, a translation time, a linking time, a loading time, or a runtime. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes modifying one or more code segments, lines of code, statements, instructions, functions, routines, subroutines, or basic blocks. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes a manual, an automatic, a dynamic, or a just in time (JIT) instrumentation of an application, the application running on the processor circuit. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes utilizing one or more of a .NET tool, a .NET application programming interface (API), a Java tool, a Java API, an operating system tool, or an independent tool for modifying instruction sets. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes utilizing at least one of: a dynamic, an interpreted, or a scripting programming language. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes utilizing at least one of: a dynamic code, a dynamic class loading, or a reflection. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes utilizing an assembly language. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes utilizing at least one of: a metaprogramming, a self-modifying code, or an instruction set modification tool. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes utilizing at least one of: just in time (JIT) compiling, JIT interpretation, JIT translation, dynamic recompiling, or binary rewriting. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes utilizing at least one of: a dynamic expression creation, a dynamic expression execution, a dynamic function creation, or a dynamic function execution. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes adding or inserting additional code into a code of an application, the application running on the processor circuit. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes at least one of: modifying, removing, rewriting, or overwriting a code of an application, the application running on the processor circuit. In further embodiments, the causing the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes at least one of: branching, redirecting, extending, or hot swapping a code of an application, the application running on the processor circuit. The branching or redirecting the code may include inserting at least one of: a branch, a jump, or a means for redirecting an execution.

In some embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes implementing a user's knowledge, style, or methodology of operating the device in a visual surrounding.

In certain embodiments, the system further comprises: an interface configured to cause execution of instruction sets, wherein the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures is caused by the interface. The interface may include a modification interface.

In some embodiments, the artificial intelligence unit is further configured to: receive at least one extra information. In further embodiments, the at least one extra information include one or more of: an information on a stream of digital pictures, an information on an object in the stream of digital pictures, an information on the device's visual surrounding, an information on an instruction set, an information on an application, an information on an object of the application, an information on the processor circuit, an information on the device, or an information on an user. In further embodiments, the artificial intelligence unit is further configured to: learn the first stream of digital pictures correlated with the at least one extra information. The learning the first stream of digital pictures correlated with at least one extra information may include correlating the first stream of digital pictures with the at least one extra information. The learning the first stream of digital pictures correlated with at least one extra

information may include storing the first stream of digital pictures correlated with the at least one extra information into the memory unit. In further embodiments, the anticipating the one or more instruction sets for operating the device correlated with the first stream of digital pictures based on at least a partial match between the new stream of digital pictures and the first stream of digital pictures includes anticipating the one or more instruction sets for operating the device correlated with the first stream of digital pictures based on at least a partial match between an extra information correlated with the new stream of digital pictures and an extra information correlated with the first stream of digital pictures. The anticipating the one or more instruction sets for operating the device correlated with the first stream of digital pictures based on at least a partial match between an extra information correlated with the new stream of digital pictures and an extra information correlated with the first stream of digital pictures may include comparing an extra information correlated with the new stream of digital pictures and an extra information correlated with the first stream of digital pictures. The anticipating the one or more instruction sets for operating the device correlated with the first stream of digital pictures based on at least a partial match between an extra information correlated with the new stream of digital pictures and an extra information correlated with the first stream of digital pictures may include determining that a similarity between an extra information correlated with the new stream of digital pictures and an extra information correlated with the first stream of digital pictures exceeds a similarity threshold.

In certain embodiments, the artificial intelligence unit is further configured to: receive a second stream of digital pictures from the picture capturing apparatus; receive additional one or more instruction sets for operating the device from the processor circuit; and learn the second stream of digital pictures correlated with the additional one or more instruction sets for operating the device. In further embodiments, the learning the first stream of digital pictures correlated with the one or more instruction sets for operating the device and the learning the second stream of digital pictures correlated with the additional one or more instruction sets for operating the device include creating a connection between the first stream of digital pictures correlated with the one or more instruction sets for operating the device and the second stream of digital pictures correlated with the additional one or more instruction sets for operating the device. The connection includes or is associated with at least one of: an occurrence count, a weight, a parameter, or a data. In further embodiments, the learning the first stream of digital pictures correlated with the one or more instruction sets for operating the device and the learning the second stream of digital pictures correlated with the additional one or more instruction sets for operating the device include updating a connection between the first stream of digital pictures correlated with the one or more instruction sets for operating the device and the second stream of digital pictures correlated with the additional one or more instruction sets for operating the device. The updating the connection between the first stream of digital pictures correlated with the one or more instruction sets for operating the device and the second stream of digital pictures correlated with the additional one or more instruction sets for operating the device may include updating at least one of: an occurrence count, a weight, a parameter, or a data included in or associated with the connection. In further embodiments, the learning the first stream of digital pictures correlated with the one or more instruction sets for operating the device includes storing the first stream of digital pictures correlated with the one or more instruction sets for operating the device into a first node of a data structure, and wherein the learning the second stream of digital pictures correlated with the additional one or more instruction sets for operating the device includes storing the second stream of digital pictures correlated with the additional one or more instruction sets for operating the device into a second node of the data structure. The data structure may include a neural network, a graph, a collection of sequences, a sequence, a collection of knowledge cells, a knowledgebase, or a knowledge structure. The learning the first stream of digital pictures correlated with the one or more instruction sets for operating the device and the learning the second stream of digital pictures correlated with the additional one or more instruction sets for operating the device may include creating a connection between the first node and the second node. The learning the first stream of digital pictures correlated with the one or more instruction sets for operating the device and the learning the second stream of digital pictures correlated with the additional one or more instruction sets for operating the device may include updating a connection between the first node and the second node. In further embodiments, the first stream of digital pictures correlated with the one or more instruction sets for operating the device is stored into a first node of a neural network and the second stream of digital pictures correlated with the additional one or more instruction sets for operating the device is stored into a second node of the neural network. The first node and the second node may be connected by a connection. The first node may be part of a first layer of the neural network and the second node may be part of a second layer of the neural network. In further embodiments, the first stream of digital pictures correlated with the one or more instruction sets for operating the device is stored into a first node of a graph and the second stream of digital pictures correlated with the additional one or more instruction sets for operating the device is stored into a second node of the graph. The first node and the second node may be connected by a connection. In further embodiments, the first stream of digital pictures correlated with the one or more instruction sets for operating the device is stored into a first node of a sequence and the second stream of digital pictures correlated with the additional one or more instruction sets for operating the device is stored into a second node of the sequence.

In some aspects, the disclosure relates to a non-transitory computer storage medium having a computer program stored thereon, the program including instructions that when executed by one or more processor circuits cause the one or more processor circuits to perform operations comprising: receiving a first stream of digital pictures from a picture capturing apparatus. The operations may further include: receiving one or more instruction sets for operating a device. The operations may further include: learning the first stream of digital pictures correlated with the one or more instruction sets for operating the device. The operations may further include: receiving a new stream of digital pictures from the picture capturing apparatus. The operations may further include: anticipating the one or more instruction sets for operating the device correlated with the first stream of digital pictures based on at least a partial match between the new stream of digital pictures and the first stream of digital pictures. The operations may further include: causing an execution of the one or more instruction sets for operating the device correlated with the first stream of digital pictures, the causing performed in response to the anticipating the one or more instruction sets for operating the device correlated

with the first stream of digital pictures based on at least a partial match between the new stream of digital pictures and the first stream of digital pictures, wherein the device performs one or more operations defined by the one or more instruction sets for operating the device correlated with the first stream of digital pictures, the one or more operations performed in response to the executing.

In some aspects, the disclosure relates to a method comprising: (a) receiving a first stream of digital pictures from a picture capturing apparatus by one or more processor circuits. The method may further include: (b) receiving one or more instruction sets for operating a device by the one or more processor circuits. The method may further include: (c) learning the first stream of digital pictures correlated with the one or more instruction sets for operating the device, the learning of (c) performed by the one or more processor circuits. The method may further include: (d) receiving a new stream of digital pictures from the picture capturing apparatus by the one or more processor circuits. The method may further include: (e) anticipating the one or more instruction sets for operating the device correlated with the first stream of digital pictures based on at least a partial match between the new stream of digital pictures and the first stream of digital pictures, the anticipating of (e) performed by the one or more processor circuits. The method may further include: (f) executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures, the executing of (f) performed in response to the anticipating of (e). The method may further include: (g) performing, by the device, one or more operations defined by the one or more instruction sets for operating the device correlated with the first stream of digital pictures, the one or more operations performed in response to the executing of (f).

The operations or steps of the non-transitory computer storage medium and/or the method may be performed by any of the elements of the above described systems as applicable. The non-transitory computer storage medium and/or the method may include any of the operations, steps, and embodiments of the above described systems as applicable as well as the following embodiments.

In some embodiments, the first stream of digital pictures correlated with the one or more instruction sets for operating the device includes a unit of knowledge of how the device operated in a visual surrounding. In further embodiments, the first stream of digital pictures correlated with the one or more instruction sets for operating the device is included in a neuron, a node, a vertex, or an element of a data structure. The data structure may include a neural network, a graph, a collection of sequences, a sequence, a collection of knowledge cells, a knowledgebase, or a knowledge structure. Some of the neurons, nodes, vertices, or elements may be interconnected. In further embodiments, the first stream of digital pictures correlated with the one or more instruction sets for operating the device is structured into a knowledge cell. In further embodiments, the knowledge cell includes a unit of knowledge of how the device operated in a visual surrounding. In further embodiments, the knowledge cell is included in a neuron, a node, a vertex, or an element of a data structure. The data structure may include a neural network, a graph, a collection of sequences, a sequence, a collection of knowledge cells, a knowledgebase, or a knowledge structure. Some of the neurons, nodes, vertices, or elements may be interconnected.

In certain embodiments, the learning the first stream of digital pictures correlated with the one or more instruction sets for operating the device includes correlating the first stream of digital pictures with the one or more instruction sets for operating the device. The correlating the first stream of digital pictures with the one or more instruction sets for operating the device may include generating a knowledge cell, the knowledge cell comprising the first stream of digital pictures correlated with the one or more instruction sets for operating the device. The correlating the first stream of digital pictures with the one or more instruction sets for operating the device may include structuring a unit of knowledge of how the device operated in a visual surrounding. In further embodiments, the learning the first stream of digital pictures correlated with the one or more instruction sets for operating the device includes learning a user's knowledge, style, or methodology of operating the device in a visual surrounding. In further embodiments, the learning the first stream of digital pictures correlated with the one or more instruction sets for operating the device includes spontaneous learning the first stream of digital pictures correlated with the one or more instruction sets for operating the device.

In some embodiments, the learning the first stream of digital pictures correlated with the one or more instruction sets for operating the device includes storing, into a memory unit, the first stream of digital pictures correlated with the one or more instruction sets for operating the device, the first stream of digital pictures correlated with the one or more instruction sets for operating the device being part of a stored plurality of streams of digital pictures correlated with one or more instruction sets for operating the device. In further embodiments, the plurality of streams of digital pictures correlated with one or more instruction sets for operating the device include a neural network, a graph, a collection of sequences, a sequence, a collection of knowledge cells, a knowledgebase, a knowledge structure, or a data structure. In further embodiments, the plurality of streams of digital pictures correlated with one or more instruction sets for operating the device are organized into a neural network, a graph, a collection of sequences, a sequence, a collection of knowledge cells, a knowledgebase, a knowledge structure, or a data structure. In further embodiments, each of the plurality of streams of digital pictures correlated with one or more instruction sets for operating the device is included in a neuron, a node, a vertex, or an element of a data structure. The data structure may include a neural network, a graph, a collection of sequences, a sequence, a collection of knowledge cells, a knowledgebase, or a knowledge structure. Some of the neurons, nodes, vertices, or elements may be interconnected. In further embodiments, the plurality of streams of digital pictures correlated with one or more instruction sets for operating the device include a user's knowledge, style, or methodology of operating the device in visual surroundings. In further embodiments, the plurality of streams of digital pictures correlated with one or more instruction sets for operating the device are stored on a remote computing device. In further embodiments, the plurality of streams of digital pictures correlated with one or more instruction sets for operating the device include an artificial intelligence system for knowledge structuring, storing, or representation. The artificial intelligence system for knowledge structuring, storing, or representation may include at least one of: a deep learning system, a supervised learning system, an unsupervised learning system, a neural network, a search-based system, an optimization-based system, a logic-based system, a fuzzy logic-based system, a tree-based system, a graph-based system, a hierarchical system, a symbolic system, a sub-symbolic system, an evolutionary system, a genetic system,

a multi-agent system, a deterministic system, a probabilistic system, or a statistical system.

In further embodiments, the anticipating the one or more instruction sets for operating the device correlated with the first stream of digital pictures based on at least a partial match between the new stream of digital pictures and the first stream of digital pictures includes comparing at least one portion of the new stream of digital pictures with at least one portion of the first stream of digital pictures. The at least one portion of the new stream of digital pictures may include at least one digital picture, at least one region, at least one feature, or at least one pixel of the new stream of digital pictures. The at least one portion of the first stream of digital pictures may include at least one digital picture, at least one region, at least one feature, or at least one pixel of the first stream of digital pictures. The comparing the at least one portion of the new stream of digital pictures with the at least one portion of the first stream of digital pictures may include comparing at least one digital picture of the new stream of digital pictures with at least one digital picture of the first stream of digital pictures. The comparing the at least one portion of the new stream of digital pictures with the at least one portion of the first stream of digital pictures may include comparing at least one region of at least one digital picture of the new stream of digital pictures with at least one region of at least one digital picture of the first stream of digital pictures. The comparing the at least one portion of the new stream of digital pictures with the at least one portion of the first stream of digital pictures may include comparing at least one feature of at least one digital picture of the new stream of digital pictures with at least one feature of at least one digital picture of the first stream of digital pictures. The comparing the at least one portion of the new stream of digital pictures with the at least one portion of the first stream of digital pictures may include comparing at least one pixel of at least one digital picture of the new stream of digital pictures with at least one pixel of at least one digital picture of the first stream of digital pictures. The comparing the at least one portion of the new stream of digital pictures with the at least one portion of the first stream of digital pictures may include at least one of: performing a color adjustment, performing a size adjustment, performing a content manipulation, performing temporal alignment, performing dynamic time warping, utilizing a transparency, or utilizing a mask on the new or the first stream of digital pictures. The comparing the at least one portion of the new stream of digital pictures with the at least one portion of the first stream of digital pictures may include recognizing at least one person or object in the new stream of digital pictures and at least one person or object in the first stream of digital pictures, and comparing the at least one person or object from the new stream of digital pictures with the at least one person or object from the first stream of digital pictures.

In some embodiments, the anticipating the one or more instruction sets for operating the device correlated with the first stream of digital pictures based on at least a partial match between the new stream of digital pictures and the first stream of digital pictures includes determining that there is at least a partial match between the new stream of digital pictures and the first stream of digital pictures. In further embodiments, the determining that there is at least a partial match between the new stream of digital pictures and the first stream of digital pictures includes determining that there is at least a partial match between one or more portions of the new stream of digital pictures and one or more portions of the first stream of digital pictures. In further embodiments, the determining that there is at least a partial match between the new stream of digital pictures and the first stream of digital pictures includes determining that a similarity between at least one portion of the new stream of digital pictures and at least one portion of the first stream of digital pictures exceeds a similarity threshold. In further embodiments, the determining that there is at least a partial match between the new stream of digital pictures and the first stream of digital pictures includes determining a substantial similarity between at least one portion of the new stream of digital pictures and at least one portion of the first stream of digital pictures. The at least one portion of the new stream of digital pictures may include at least one digital picture, at least one region, at least one feature, or at least one pixel of the new stream of digital pictures. The at least one portion of the first stream of digital pictures may include at least one digital picture, at least one region, at least one feature, or at least one pixel of the first stream of digital pictures. The substantial similarity may be achieved when a similarity between the at least one portion of the new stream of digital pictures and the at least one portion of the first stream of digital pictures exceeds a similarity threshold. The substantial similarity may be achieved when a number or a percentage of matching or partially matching digital pictures from the new stream of digital pictures and from the first stream of digital pictures exceeds a threshold number or threshold percentage. The substantial similarity may be achieved when a number or a percentage of matching or partially matching regions of at least one digital picture from the new stream of digital pictures and from the first stream of digital pictures exceeds a threshold number or threshold percentage. The substantial similarity may be achieved when a number or a percentage of matching or partially matching features of at least one digital picture from the new stream of digital pictures and from the first stream of digital pictures exceeds a threshold number or threshold percentage. The substantial similarity may be achieved when a number or a percentage of matching or partially matching pixels of at least one digital picture from the new stream of digital pictures and from the first stream of digital pictures exceeds a threshold number or threshold percentage. The substantial similarity may be achieved when one or more same or similar objects are recognized in the new stream of digital pictures and the first stream of digital pictures. In further embodiments, the determining that there is at least a partial match between the new stream of digital pictures and the first stream of digital pictures includes determining that a number or a percentage of matching digital pictures from the new stream of digital pictures and from the first stream of digital pictures exceeds a threshold number or threshold percentage. The matching digital pictures from the new stream of digital pictures and from the first stream of digital pictures may be determined factoring in at least one of: an order of a digital picture in a stream of digital pictures, an importance of a digital picture, a threshold for a similarity in a digital picture, or a threshold for a difference in a digital picture. In further embodiments, the determining that there is at least a partial match between the new stream of digital pictures and the first stream of digital pictures includes determining that a number or a percentage of matching regions from at least one digital picture of the new stream of digital pictures and from at least one digital picture of the first stream of digital pictures exceeds a threshold number or threshold percentage. The matching regions from at least one digital picture of the new stream of digital pictures and from at least one digital picture of the first stream of digital pictures may be determined factoring in at least one of: a

location of a region, an importance of a region, a threshold for a similarity in a region, or a threshold for a difference in a region. In further embodiments, the determining that there is at least a partial match between the new stream of digital pictures and the first stream of digital pictures includes determining that a number or a percentage of matching features from at least one digital picture of the new stream of digital pictures and from at least one digital picture of the first stream of digital pictures exceeds a threshold number or threshold percentage. The matching features from at least one digital picture of the new stream of digital pictures and from at least one digital picture of the first stream of digital pictures may be determined factoring in at least one of: a type of a feature, an importance of a feature, a location of a feature, a threshold for a similarity in a feature, or a threshold for a difference in a feature. In further embodiments, the determining that there is at least a partial match between the new stream of digital pictures and the first stream of digital pictures includes determining that a number or a percentage of matching pixels from at least one digital picture of the new stream of digital pictures and from at least one digital picture of the first stream of digital pictures exceeds a threshold number or threshold percentage. The matching pixels from at least one digital picture of the new stream of digital pictures and from at least one digital picture of the first stream of digital pictures may be determined factoring in at least one of: a location of a pixel, a threshold for a similarity in a pixel, or a threshold for a difference in a pixel. In further embodiments, the determining that there is at least a partial match between the new stream of digital pictures and the first stream of digital pictures includes recognizing a same person or object in the new and the first streams of digital pictures.

In certain embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures instead of or prior to an instruction set that would have been executed next. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes modifying one or more instruction sets. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes modifying a register or an element of a processor circuit. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes inserting the one or more instruction sets for operating the device correlated with the first stream of digital pictures into a register or an element of a processor circuit. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes redirecting a processor circuit to the one or more instruction sets for operating the device correlated with the first stream of digital pictures. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes redirecting a processor circuit to one or more alternate instruction sets, the alternate instruction sets comprising the one or more instruction sets for operating the device correlated with the first stream of digital pictures. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes transmitting, to a processor circuit for execution, the one or more instruction sets for operating the device correlated with the first stream of digital pictures. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes issuing an interrupt to a processor circuit and executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures following the interrupt. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes modifying an element that is part of, operating on, or coupled to a processor circuit.

In some embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes executing, by a logic circuit, the one or more instruction sets for operating the device correlated with the first stream of digital pictures. The logic circuit may include a microcontroller. The executing, by the logic circuit, the one or more instruction sets for operating the device correlated with the first stream of digital pictures may include modifying an element of the logic circuit. The executing, by the logic circuit, the one or more instruction sets for operating the device correlated with the first stream of digital pictures may include inserting the one or more instruction sets for operating the device correlated with the first stream of digital pictures into an element of the logic circuit. The executing, by the logic circuit, the one or more instruction sets for operating the device correlated with the first stream of digital pictures may include redirecting the logic circuit to the one or more instruction sets for operating the device correlated with the first stream of digital pictures. The executing, by the logic circuit, the one or more instruction sets for operating the device correlated with the first stream of digital pictures may include replacing inputs into the logic circuit with the one or more instruction sets for operating the device correlated with the first stream of digital pictures. The executing, by the logic circuit, the one or more instruction sets for operating the device correlated with the first stream of digital pictures my include replacing outputs from the logic circuit with the one or more instruction sets for operating the device correlated with the first stream of digital pictures.

In certain embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes executing, by an application for operating the device, the one or more instruction sets for operating the device correlated with the first stream of digital pictures. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes modifying an application, the application including instruction sets for operating the device. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes redirecting an application to the one or more instruction sets for operating the device correlated with the first stream of digital pictures. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes redirecting an application to one or more alternate instruction sets, the alternate instruction sets comprising the one or more instruction sets for operating the device correlated with the first stream of digital pictures. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes modifying one or more instruction sets of an application. In further embodiments, the executing the one or more instruction sets for operating

the device correlated with the first stream of digital pictures includes modifying a source code, a bytecode, an intermediate code, a compiled code, an interpreted code, a translated code, a runtime code, an assembly code, or a machine code. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes modifying at least one of: a memory unit, a register of a processor circuit, a storage, or a repository where instruction sets are stored or used. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes modifying one or more instruction sets for operating an application or an object of the application. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes modifying at least one of: an element of a processor circuit, an element of the device, a virtual machine, a runtime engine, an operating system, an execution stack, a program counter, or a user input. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes modifying one or more instruction sets at a source code write time, a compile time, an interpretation time, a translation time, a linking time, a loading time, or a runtime. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes modifying one or more code segments, lines of code, statements, instructions, functions, routines, subroutines, or basic blocks. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes a manual, an automatic, a dynamic, or a just in time (JIT) instrumentation of an application. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes utilizing one or more of a .NET tool, a .NET application programming interface (API), a Java tool, a Java API, an operating system tool, or an independent tool for modifying instruction sets. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes utilizing at least one of: a dynamic, an interpreted, or a scripting programming language. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes utilizing at least one of: a dynamic code, a dynamic class loading, or a reflection. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes utilizing an assembly language. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes utilizing at least one of: a metaprogramming, a self-modifying code, or an instruction set modification tool. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes utilizing at least one of: just in time (JIT) compiling, JIT interpretation, JIT translation, dynamic recompiling, or binary rewriting. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes utilizing at least one of: a dynamic expression creation, a dynamic expression execution, a dynamic function creation, or a dynamic function execution. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes adding or inserting additional code into a code of an application. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes at least one of: modifying, removing, rewriting, or overwriting a code of an application. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes at least one of: branching, redirecting, extending, or hot swapping a code of an application. The branching or redirecting the code may include inserting at least one of: a branch, a jump, or a means for redirecting an execution. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes implementing a user's knowledge, style, or methodology of operating the device in a visual surrounding. In further embodiments, the executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures includes executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures via an interface. The interface may include a modification interface.

In certain embodiments, the operations of the non-transitory computer storage medium and/or the method further comprise: receiving at least one extra information. In further embodiments, the at least one extra information include one or more of: an information on a stream of digital pictures, an information on an object in the stream of digital pictures, an information on the device's visual surrounding, an information on an instruction set, an information on an application, an information on an object of the application, an information on a processor circuit, an information on the device, or an information on an user. In further embodiments, the operations of the non-transitory computer storage medium and/or the method further comprise: learning the first stream of digital pictures correlated with the at least one extra information. The learning the first stream of digital pictures correlated with at least one extra information may include correlating the first stream of digital pictures with the at least one extra information. The learning the first stream of digital pictures correlated with at least one extra information may include storing the first stream of digital pictures correlated with the at least one extra information into a memory unit. In further embodiments, the anticipating the one or more instruction sets for operating the device correlated with the first stream of digital pictures based on at least a partial match between the new stream of digital pictures and the first stream of digital pictures includes anticipating the one or more instruction sets for operating the device correlated with the first stream of digital pictures based on at least a partial match between an extra information correlated with the new stream of digital pictures and an extra information correlated with the first stream of digital pictures. The anticipating the one or more instruction sets for operating the device correlated with the first stream of digital pictures based on at least a partial match between an extra information correlated with the new stream of digital pictures and an extra information correlated with the first stream of digital pictures may include comparing an extra information correlated with the new stream of digital pictures and an extra information correlated with the first stream of digital pictures. The anticipating the one or more instruction sets for operating the device correlated with the first stream of digital pictures based on at least a partial match between an extra information correlated with the new stream of digital pictures and an extra information correlated with the first

stream of digital pictures may include determining that a similarity between an extra information correlated with the new stream of digital pictures and an extra information correlated with the first stream of digital pictures exceeds a similarity threshold.

In some embodiments, the operations of the non-transitory computer storage medium and/or the method further comprise: receiving a second stream of digital pictures from the picture capturing apparatus; receiving additional one or more instruction sets for operating the device; and learning the second stream of digital pictures correlated with the additional one or more instruction sets for operating the device. In further embodiments, the learning the first stream of digital pictures correlated with the one or more instruction sets for operating the device and the learning the second stream of digital pictures correlated with the additional one or more instruction sets for operating the device include creating a connection between the first stream of digital pictures correlated with the one or more instruction sets for operating the device and the second stream of digital pictures correlated with the additional one or more instruction sets for operating the device. The connection may include or be associated with at least one of: an occurrence count, a weight, a parameter, or a data. In further embodiments, the learning the first stream of digital pictures correlated with the one or more instruction sets for operating the device and the learning the second stream of digital pictures correlated with the additional one or more instruction sets for operating the device include updating a connection between the first stream of digital pictures correlated with the one or more instruction sets for operating the device and the second stream of digital pictures correlated with the additional one or more instruction sets for operating the device. The updating the connection between the first stream of digital pictures correlated with the one or more instruction sets for operating the device and the second stream of digital pictures correlated with the additional one or more instruction sets for operating the device may include updating at least one of: an occurrence count, a weight, a parameter, or a data included in or associated with the connection. In further embodiments, the learning the first stream of digital pictures correlated with the one or more instruction sets for operating the device includes storing the first stream of digital pictures correlated with the one or more instruction sets for operating the device into a first node of a data structure, and wherein the learning the second stream of digital pictures correlated with the additional one or more instruction sets for operating the device includes storing the second stream of digital pictures correlated with the additional one or more instruction sets for operating the device into a second node of the data structure. The data structure may include a neural network, a graph, a collection of sequences, a sequence, a collection of knowledge cells, a knowledgebase, or a knowledge structure. The learning the first stream of digital pictures correlated with the one or more instruction sets for operating the device and the learning the second stream of digital pictures correlated with the additional one or more instruction sets for operating the device may include creating a connection between the first node and the second node. The learning the first stream of digital pictures correlated with the one or more instruction sets for operating the device and the learning the second stream of digital pictures correlated with the additional one or more instruction sets for operating the device may include updating a connection between the first node and the second node. In further embodiments, the first stream of digital pictures correlated with the one or more instruction sets for operating the device is stored into a first node of a neural network and the second stream of digital pictures correlated with the additional one or more instruction sets for operating the device is stored into a second node of the neural network. The first node and the second node may be connected by a connection. The first node may be part of a first layer of the neural network and the second node may be part of a second layer of the neural network. In further embodiments, the first stream of digital pictures correlated with the one or more instruction sets for operating the device is stored into a first node of a graph and the second stream of digital pictures correlated with the additional one or more instruction sets for operating the device is stored into a second node of the graph. The first node and the second node may be connected by a connection. In further embodiments, the first stream of digital pictures correlated with the one or more instruction sets for operating the device is stored into a first node of a sequence and the second stream of digital pictures correlated with the additional one or more instruction sets for operating the device is stored into a second node of the sequence.

In some aspects, the disclosure relates to a system for learning a visual surrounding for autonomous device operating. The system may be implemented at least in part on one or more computing devices. In some embodiments, the system comprises a processor circuit configured to execute instruction sets for operating a device. The system may further include a memory unit configured to store data. The system may further include a picture capturing apparatus configured to capture digital pictures. The system may further include an artificial intelligence unit. In some embodiments, the artificial intelligence unit may be configured to: receive a first stream of digital pictures from the picture capturing apparatus. The artificial intelligence unit may be further configured to: receive one or more instruction sets for operating the device from the processor circuit. The artificial intelligence unit may be further configured to: learn the first stream of digital pictures correlated with the one or more instruction sets for operating the device.

In some aspects, the disclosure relates to a non-transitory computer storage medium having a computer program stored thereon, the program including instructions that when executed by one or more processor circuits cause the one or more processor circuits to perform operations comprising: receiving a first stream of digital pictures from a picture capturing apparatus. The operations may further include: receiving one or more instruction sets for operating a device. The operations may further include: learning the first stream of digital pictures correlated with the one or more instruction sets for operating the device.

In some aspects, the disclosure relates to a method comprising: (a) receiving a first stream of digital pictures from a picture capturing apparatus by one or more processor circuits. The method may further include: (b) receiving one or more instruction sets for operating a device by the one or more processor circuits. The method may further include: (c) learning the first stream of digital pictures correlated with the one or more instruction sets for operating the device, the learning of (c) performed by the one or more processor circuits.

The operations or steps of the non-transitory computer storage medium and/or the method may be performed by any of the elements of the above described systems as applicable. The non-transitory computer storage medium and/or the method may include any of the operations, steps, and embodiments of the above described systems as applicable.

In some aspects, the disclosure relates to a system for using a visual surrounding for autonomous device operating. The system may be implemented at least in part on one or more computing devices. In some embodiments, the system comprises a processor circuit configured to execute instruction sets for operating a device. The system may further include a memory unit configured to store data. The system may further include a picture capturing apparatus configured to capture digital pictures. The system may further include an artificial intelligence unit. In some embodiments, the artificial intelligence unit may be configured to: access the memory unit that stores a plurality of streams of digital pictures correlated with one or more instruction sets for operating the device, the plurality including a first stream of digital pictures correlated with one or more instruction sets for operating the device. The artificial intelligence unit may be further configured to: receive a new stream of digital pictures from the picture capturing apparatus. The artificial intelligence unit may be further configured to: anticipate the one or more instruction sets for operating the device correlated with the first stream of digital pictures based on at least a partial match between the new stream of digital pictures and the first stream of digital pictures. The artificial intelligence unit may be further configured to: cause the processor circuit to execute the one or more instruction sets for operating the device correlated with the first stream of digital pictures, the executing performed in response to the anticipating of the artificial intelligence unit, wherein the device performs one or more operations defined by the one or more instruction sets for operating the device correlated with the first stream of digital pictures, the one or more operations performed in response to the executing by the processor circuit.

In some aspects, the disclosure relates to a non-transitory computer storage medium having a computer program stored thereon, the program including instructions that when executed by one or more processor circuits cause the one or more processor circuits to perform operations comprising: accessing a memory unit that stores a plurality of streams of digital pictures correlated with one or more instruction sets for operating a device, the plurality including a first stream of digital pictures correlated with one or more instruction sets for operating the device. The operations may further include: receiving a new stream of digital pictures from a picture capturing apparatus. The operations may further include: anticipating the one or more instruction sets for operating the device correlated with the first stream of digital pictures based on at least a partial match between the new stream of digital pictures and the first stream of digital pictures. The operations may further include: causing an execution of the one or more instruction sets for operating the device correlated with the first stream of digital pictures, the causing performed in response to the anticipating the one or more instruction sets for operating the device correlated with the first stream of digital pictures based on at least a partial match between the new stream of digital pictures and the first stream of digital pictures, wherein the device performs one or more operations defined by the one or more instruction sets for operating the device correlated with the first stream of digital pictures, the one or more operations performed in response to the executing.

In some aspects, the disclosure relates to a method comprising: (a) accessing a memory unit that stores a plurality of streams of digital pictures correlated with one or more instruction sets for operating a device, the plurality including a first stream of digital pictures correlated with one or more instruction sets for operating the device, the accessing of (a) performed by the one or more processor circuits. The method may further include: (b) receiving a new stream of digital pictures from a picture capturing apparatus by the one or more processor circuits. The method may further include: (c) anticipating the one or more instruction sets for operating the device correlated with the first stream of digital pictures based on at least a partial match between the new stream of digital pictures and the first stream of digital pictures, the anticipating of (c) performed by the one or more processor circuits. The method may further include: (d) executing the one or more instruction sets for operating the device correlated with the first stream of digital pictures, the executing of (d) performed in response to the anticipating of (c). The method may further include: (e) performing, by the device, one or more operations defined by the one or more instruction sets for operating the device correlated with the first stream of digital pictures, the one or more operations performed in response to the executing of (d).

The operations or steps of the non-transitory computer storage medium and/or the method may be performed by any of the elements of the above described systems as applicable. The non-transitory computer storage medium and/or the method may include any of the operations, steps, and embodiments of the above described systems as applicable.

In some aspects, the disclosure relates to a system for learning and using a visual surrounding for autonomous device operating. The system may be implemented at least in part on one or more computing devices. In some embodiments, the system comprises a logic circuit configured to receive inputs and produce outputs, the outputs for operating a device. The system may further include a memory unit configured to store data. The system may further include a picture capturing apparatus configured to capture digital pictures. The system may further include an artificial intelligence unit. In some embodiments, the artificial intelligence unit may be configured to: receive a first digital picture from the picture capturing apparatus. The artificial intelligence unit may be further configured to: receive at least one input, wherein the at least one input is also received by the logic circuit. The artificial intelligence unit may be further configured to: learn the first digital picture correlated with the at least one input. The artificial intelligence unit may be further configured to: receive a new digital picture from the picture capturing apparatus. The artificial intelligence unit may be further configured to: anticipate the at least one input correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture. The artificial intelligence unit may be further configured to: cause the logic circuit to receive the at least one input correlated with the first digital picture, the causing performed in response to the anticipating of the artificial intelligence unit, wherein the device performs at least one operation defined by at least one output for operating the device produced by the logic circuit.

In certain embodiments, the logic circuit configured to receive inputs and produce outputs includes a logic circuit configured to produce outputs based at least in part on logic operations performed on the inputs. In further embodiments, the learning the first digital picture correlated with the at least one input includes correlating the first digital picture with the at least one input. In further embodiments, the learning the first digital picture correlated with the at least one input includes storing, into the memory unit, the first digital picture correlated with the at least one input, the first digital picture correlated with the at least input being part of a stored plurality of digital pictures correlated with at least

one input. In further embodiments, the anticipating the at least one input correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture includes comparing at least one portion of the new digital picture with at least one portion of the first digital picture. In further embodiments, the anticipating the at least one input correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture includes determining that there is at least a partial match between the new digital picture and the first digital picture. In further embodiments, the causing the logic circuit to receive the at least one input correlated with the first digital picture includes transmitting, to the logic circuit, the at least one input correlated with the first digital picture. In further embodiments, the causing the logic circuit to receive the at least one input correlated with the first digital picture includes replacing at least one input into the logic circuit with the at least one input correlated with the first digital picture.

In some aspects, the disclosure relates to a non-transitory computer storage medium having a computer program stored thereon, the program including instructions that when executed by one or more processor circuits cause the one or more processor circuits to perform operations comprising: receiving a first digital picture from a picture capturing apparatus. The operations may further include: receiving at least one input, wherein the at least one input is also received by a logic circuit, and wherein the logic circuit is configured to receive inputs and produce outputs, the outputs for operating a device. The operations may further include: learning the first digital picture correlated with the at least one input. The operations may further include: receiving a new digital picture from the picture capturing apparatus. The operations may further include: anticipating the at least one input correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture. The operations may further include: causing the logic circuit to receive the at least one input correlated with the first digital picture, the causing performed in response to the anticipating the at least one input correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture, wherein the device performs at least one operation defined by at least one output for operating the device produced by the logic circuit.

In some aspects, the disclosure relates to a method comprising: (a) receiving a first digital picture from a picture capturing apparatus by one or more processor circuits. The method may further include: (b) receiving at least one input by the one or more processor circuits, wherein the at least one input are also received by a logic circuit, and wherein the logic circuit is configured to receive inputs and produce outputs, the outputs for operating a device. The method may further include: (c) learning the first digital picture correlated with the at least one input, the learning of (c) performed by the one or more processor circuits. The method may further include: (d) receiving a new digital picture from the picture capturing apparatus by the one or more processor circuits. The method may further include: (e) anticipating the at least one input correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture, the anticipating of (e) performed by the one or more processor circuits. The method may further include: (f) receiving, by the logic circuit, the at least one input correlated with the first digital picture, the receiving of (f) performed in response to the anticipating of (e). The method may further include: (g) performing, by the device, at least one operation defined by at least one output for operating the device produced by the logic circuit.

The operations or steps of the non-transitory computer storage medium and/or the method may be performed by any of the elements of the above described systems as applicable. The non-transitory computer storage medium and/or the method may include any of the operations, steps, and embodiments of the above described systems as applicable.

In some aspects, the disclosure relates to a system for learning and using a visual surrounding for autonomous device operating. The system may be implemented at least in part on one or more computing devices. In some embodiments, the system comprises a logic circuit configured to receive inputs and produce outputs, the outputs for operating a device. The system may further include a memory unit configured to store data. The system may further include a picture capturing apparatus configured to capture digital pictures. The system may further include an artificial intelligence unit. In some embodiments, the artificial intelligence unit may be configured to: receive a first digital picture from the picture capturing apparatus. The artificial intelligence unit may be further configured to: receive at least one output, the at least one output transmitted from the logic circuit. The artificial intelligence unit may be further configured to: learn the first digital picture correlated with the at least one output. The artificial intelligence unit may be further configured to: receive a new digital picture from the picture capturing apparatus. The artificial intelligence unit may be further configured to: anticipate the at least one output correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture. The artificial intelligence unit may be further configured to: cause the device to perform at least one operation defined by the at least one output correlated with the first digital picture.

In certain embodiments, the logic circuit configured to receive inputs and produce outputs includes a logic circuit configured to produce outputs based at least in part on logic operations performed on the inputs. In further embodiments, the learning the first digital picture correlated with the at least one output includes correlating the first digital picture with the at least one output. In further embodiments, the learning the first digital picture correlated with the at least one output includes storing, into the memory unit, the first digital picture correlated with the at least one output, the first digital picture correlated with the at least output being part of a stored plurality of digital pictures correlated with at least one output. In further embodiments, the anticipating the at least one output correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture includes comparing at least one portion of the new digital picture with at least one portion of the first digital picture. In further embodiments, the anticipating the at least one output correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture includes determining that there is at least a partial match between the new digital picture and the first digital picture. In further embodiments, the causing the device to perform at least one operation defined by the at least one output correlated with the first digital picture includes replacing at least one output from the logic circuit with the at least one output correlated with the first digital picture.

In some aspects, the disclosure relates to a non-transitory computer storage medium having a computer program stored thereon, the program including instructions that when

executed by one or more processor circuits cause the one or more processor circuits to perform operations comprising: receiving a first digital picture from the picture capturing apparatus. The operations may further include: receiving at least one output, the at least one output transmitted from a logic circuit, wherein the logic circuit is configured to receive inputs and produce outputs, the outputs for operating a device. The operations may further include: learning the first digital picture correlated with the at least one output. The operations may further include: receiving a new digital picture from the picture capturing apparatus. The operations may further include: anticipating the at least one output correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture. The operations may further include: causing the device to perform at least one operation defined by the at least one output correlated with the first digital picture.

In some aspects, the disclosure relates to a method comprising: (a) receiving a first digital picture from the picture capturing apparatus by one or more processor circuits. The method may further include: (b) receiving at least one output by the one or more processor circuits, the at least one output transmitted from a logic circuit, wherein the logic circuit is configured to receive inputs and produce outputs, the outputs for operating a device. The method may further include: (c) learning the first digital picture correlated with the at least one output, the learning of (c) performed by the one or more processor circuits. The method may further include: (d) receiving a new digital picture from the picture capturing apparatus by the one or more processor circuits. The method may further include: (e) anticipating the at least one output correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture, the anticipating of (e) performed by the one or more processor circuits. The method may further include: (f) performing, by the device, at least one operation defined by the at least one output correlated with the first digital picture.

The operations or steps of the non-transitory computer storage medium and/or the method may be performed by any of the elements of the above described systems as applicable. The non-transitory computer storage medium and/or the method may include any of the operations, steps, and embodiments of the above described systems as applicable.

In some aspects, the disclosure relates to a system for learning and using a visual surrounding for autonomous device operating. The system may be implemented at least in part on one or more computing devices. In some embodiments, the system comprises an actuator configured to receive inputs and perform motions. The system may further include a memory unit configured to store data. The system may further include a picture capturing apparatus configured to capture digital pictures. The system may further include an artificial intelligence unit. In some embodiments, the artificial intelligence unit may be configured to: receive a first digital picture from the picture capturing apparatus. The artificial intelligence unit may be further configured to: receive at least one input, wherein the at least one input is also received by the actuator. The artificial intelligence unit may be further configured to: learn the first digital picture correlated with the at least one input. The artificial intelligence unit may be further configured to: receive a new digital picture from the picture capturing apparatus. The artificial intelligence unit may be further configured to. The artificial intelligence unit may be further configured to: anticipate the at least one input correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture. The artificial intelligence unit may be further configured to: cause the actuator to receive the at least one input correlated with the first digital picture, the causing performed in response to the anticipating of the artificial intelligence unit, wherein the actuator performs at least one motion defined by the at least one input correlated with the first digital picture.

In some aspects, the disclosure relates to a non-transitory computer storage medium having a computer program stored thereon, the program including instructions that when executed by one or more processor circuits cause the one or more processor circuits to perform operations comprising: receiving a first digital picture from a picture capturing apparatus. The operations may further include: receiving at least one input, wherein the at least one input is also received by an actuator, and wherein the actuator is configured to receive inputs and perform motions. The operations may further include: learning the first digital picture correlated with the at least one input. The operations may further include: receiving a new digital picture from the picture capturing apparatus. The operations may further include: anticipating the at least one input correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture. The operations may further include: causing the actuator to receive the at least one input correlated with the first digital picture, the causing performed in response to the anticipating the at least one input correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture, wherein the actuator performs at least one motion defined by the at least one input correlated with the first digital picture.

In some aspects, the disclosure relates to a method comprising: (a) receiving a first digital picture from a picture capturing apparatus by one or more processor circuits. The method may further include: (b) receiving at least one input by the one or more processor circuits, wherein the at least one input are also received by an actuator, and wherein the actuator is configured to receive inputs and perform motions. The method may further include: (c) learning the first digital picture correlated with the at least one input, the learning of (c) performed by the one or more processor circuits. The method may further include: (d) receiving a new digital picture from the picture capturing apparatus by the one or more processor circuits. The method may further include: (e) anticipating the at least one input correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture, the anticipating of (e) performed by the one or more processor circuits. The method may further include: (f) receiving, by the actuator, the at least one input correlated with the first digital picture, the receiving of (f) performed in response to the anticipating of (e). The method may further include: (g) performing, by the actuator, at least one motion defined by the at least one input correlated with the first digital picture.

The operations or steps of the non-transitory computer storage medium and/or the method may be performed by any of the elements of the above described systems as applicable. The non-transitory computer storage medium and/or the method may include any of the operations, steps, and embodiments of the above described systems as applicable.

Other features and advantages of the disclosure will become apparent from the following description, including the claims and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates a block diagram of Computing Device **70** that can provide processing capabilities used in some of the disclosed embodiments.

FIG. **2** illustrates an embodiment of Device **98** comprising Unit for Learning and/or Using Visual Surrounding for Autonomous Device Operation (VSADO Unit **100**).

FIG. **3** illustrates some embodiments of obtaining instruction sets, data, and/or other information through tracing, profiling, or sampling of Processor **11** registers, memory, or other computing system components.

FIGS. **4**A-**4**B illustrate some embodiments of obtaining instruction sets, data, and/or other information through tracing, profiling, or sampling of Logic Circuit **250**.

FIGS. **5**A-**5**E illustrate some embodiments of Instruction Sets **526**.

FIGS. **6**A-**6**B illustrate some embodiments of Extra Information **527**.

FIG. **7** illustrates an embodiment where VSADO Unit **100** is part of or operating on Processor **11**.

FIG. **8** illustrates an embodiment where VSADO Unit **100** resides on Server **96** accessible over Network **95**.

FIG. **9** illustrates an embodiment where Picture Capturing Apparatus **90** is part of Remote Device **97** accessible over Network **95**.

FIG. **10** illustrates an embodiment of VSADO Unit **100** comprising Picture Recognizer **350**.

FIG. **11** illustrates an embodiment of Artificial Intelligence Unit **110**.

FIG. **12** illustrates an embodiment of Knowledge Structuring Unit **520** correlating individual Digital Pictures **525** with any Instruction Sets **526** and/or Extra Info **527**.

FIG. **13** illustrates another embodiment of Knowledge Structuring Unit **520** correlating individual Digital Pictures **525** with any Instruction Sets **526** and/or Extra Info **527**.

FIG. **14** illustrates an embodiment of Knowledge Structuring Unit **520** correlating streams of Digital Pictures **525** with any Instruction Sets **526** and/or Extra Info **527**.

FIG. **15** illustrates another embodiment of Knowledge Structuring Unit **520** correlating streams of Digital Pictures **525** with any Instruction Sets **526** and/or Extra Info **527**.

FIG. **16** illustrates various artificial intelligence methods, systems, and/or models that can be utilized in VSADO Unit **100** embodiments.

FIGS. **17**A-**17**C illustrate embodiments of interconnected Knowledge Cells **800** and updating weights of Connections **853**.

FIG. **18** illustrates an embodiment of learning Knowledge Cells **800** comprising one or more Digital Pictures **525** correlated with any Instruction Sets **526** and/or Extra Info **527** using Collection of Knowledge Cells **530***d*.

FIG. **19** illustrates an embodiment of learning Knowledge Cells **800** comprising one or more Digital Pictures **525** correlated with any Instruction Sets **526** and/or Extra Info **527** using Neural Network **530***a*.

FIG. **20** illustrates an embodiment of learning Knowledge Cells **800** comprising one or more Digital Pictures **525** correlated with any Instruction Sets **526** and/or Extra Info **527** using Neural Network **530***a* comprising shortcut Connections **853**.

FIG. **21** illustrates an embodiment of learning Knowledge Cells **800** comprising one or more Digital Pictures **525** correlated with any Instruction Sets **526** and/or Extra Info **527** using Graph **530***b*.

FIG. **22** illustrates an embodiment of learning Knowledge Cells **800** comprising one or more Digital Pictures **525** correlated with any Instruction Sets **526** and/or Extra Info **527** using Collection of Sequences **530***c*.

FIG. **23** illustrates an embodiment of determining anticipatory Instruction Sets **526** from a single Knowledge Cell **800**.

FIG. **24** illustrates an embodiment of determining anticipatory Instruction Sets **526** by traversing a single Knowledge Cell **800**.

FIG. **25** illustrates an embodiment of determining anticipatory Instruction Sets **526** using collective similarity comparisons.

FIG. **26** illustrates an embodiment of determining anticipatory Instruction Sets **526** using Neural Network **530***a*.

FIG. **27** illustrates an embodiment of determining anticipatory Instruction Sets **526** using Graph **530***b*.

FIG. **28** illustrates an embodiment of determining anticipatory Instruction Sets **526** using Collection of Sequences **530***c*.

FIG. **29** illustrates some embodiments of modifying execution and/or functionality of Processor **11** through modification of Processor **11** registers, memory, or other computing system components.

FIGS. **30**A-**30**B illustrate some embodiments of modifying execution and/or functionality of Logic Circuit **250** through modification of inputs and/or outputs of Logic Circuit **250**.

FIG. **31** illustrates a flow chart diagram of an embodiment of method **6100** for learning and/or using visual surrounding for autonomous device operation.

FIG. **32** illustrates a flow chart diagram of an embodiment of method **6200** for learning and/or using visual surrounding for autonomous device operation.

FIG. **33** illustrates a flow chart diagram of an embodiment of method **6300** for learning and/or using visual surrounding for autonomous device operation.

FIG. **34** illustrates a flow chart diagram of an embodiment of method **6400** for learning and/or using visual surrounding for autonomous device operation.

FIG. **35** illustrates a flow chart diagram of an embodiment of method **6500** for learning and/or using visual surrounding for autonomous device operation.

FIG. **36** illustrates a flow chart diagram of an embodiment of method **6600** for learning and/or using visual surrounding for autonomous device operation.

FIG. **37** illustrates an exemplary embodiment of Computing-enabled Machine **98***a*.

FIG. **38** illustrates an exemplary embodiment of Computing-enabled Machine **98***a* comprising or coupled to a plurality of Picture Capturing Apparatuses **90**.

FIG. **39** illustrates an exemplary embodiment of Fixture **98***b*.

FIG. **40** illustrates an exemplary embodiment of Control Device **98***c*.

FIG. **41** illustrates an exemplary embodiment of Smartphone **98***d*.

Like reference numerals in different figures indicate like elements. Horizontal or vertical " . . . " or other such indicia may be used to indicate additional instances of the same type of element n, m, x, or other such letters or indicia represent integers or other sequential numbers that follow the sequence where they are indicated. It should be noted that n, m, x, or other such letters or indicia may represent different numbers in different elements even where the elements are depicted in the same figure. In general, n, m, x, or other such letters or indicia may follow the sequence and/or context where they are indicated. Any of these or other such letters or indicia may be used interchangeably depending on the

context and space available. The drawings are not necessarily to scale, with emphasis instead being placed upon illustrating the embodiments, principles, and concepts of the disclosure. A line or arrow between any of the disclosed elements comprises an interface that enables the coupling, connection, and/or interaction between the elements.

DETAILED DESCRIPTION

The disclosed artificially intelligent devices, systems, and methods for learning and/or using visual surrounding for autonomous device operation comprise apparatuses, systems, methods, features, functionalities, and/or applications that enable learning one or more digital pictures of a device's surrounding along with correlated instruction sets for operating the device, storing this knowledge in a knowledgebase (i.e. neural network, graph, sequences, etc.), and autonomously operating a device. The disclosed artificially intelligent devices, systems, and methods for learning and/or using visual surrounding for autonomous device operation, any of their elements, any of their embodiments, or a combination thereof can generally be referred to as VSADO, VSADO Unit, or as other similar name or reference.

Referring now to FIG. **1**, an embodiment is illustrated of Computing Device **70** (also referred to simply as computing device or other similar name or reference, etc.) that can provide processing capabilities used in some embodiments of the forthcoming disclosure. Later described devices and systems, in combination with processing capabilities of Computing Device **70**, enable learning and/or using a device's visual surrounding for autonomous device operation and/or other functionalities described herein. Various embodiments of the disclosed devices, systems, and/or methods include hardware, functions, logic, programs, and/or a combination thereof that can be provided or implemented on any type or form of computing, computing enabled, or other device such as a mobile device, a computer, a computing enabled telephone, a server, a cloud device, a gaming device, a television device, a digital camera, a GPS receiver, a media player, an embedded device, a supercomputer, a wearable device, an implantable device, or any other type or form of computing, computing enabled, or other device capable of performing the operations described herein.

In some designs, Computing Device **70** comprises hardware, processing techniques or capabilities, programs, or a combination thereof. Computing Device **70** includes one or more central processing units, which may also be referred to as processors **11**. Processor **11** includes one or more memory ports **10** and/or one or more input-output ports, also referred to as I/O ports **15**, such as I/O ports **15**A and **15**B. Processor **11** may be special or general purpose. Computing Device **70** may further include memory **12**, which can be connected to the remainder of the components of Computing Device **70** via bus **5**. Memory **12** can be connected to processor **11** via memory port **10**. Computing Device **70** may also include display device **21** such as a monitor, projector, glasses, and/or other display device. Computing Device **70** may also include Human-machine Interface **23** such as a keyboard, a pointing device, a mouse, a touchscreen, a joystick, and/or other input device that can be connected with the remainder of the Computing Device **70** components via I/O control **22**. In some implementations, Human-machine Interface **23** can be connected with bus **5** or directly connected with specific components of Computing Device **70**. Computing Device **70** may include additional elements, such as one or more input/output devices **13**. Processor **11** may include or be interfaced with cache memory **14**. Storage **27** may include memory, which provides an operating system, also referred to as OS **17**, additional application programs **18** operating on OS **17**, and/or data space **19** in which additional data or information can be stored. Alternative memory device **16** can be connected to the remaining components of Computing Device **70** via bus **5**. Network interface **25** can also be connected with bus **5** and be used to communicate with external computing devices via a network. Some or all described elements of Computing Device **70** can be directly or operatively connected or coupled with each other using any other connection means known in art. Other additional elements may be included as needed, or some of the disclosed ones may be excluded, or a combination thereof may be utilized in alternate implementations of Computing Device **70**.

Processor **11** includes any logic circuitry that can respond to or process instructions fetched from memory **12** or other element. Processor **11** may also include any combination of hardware and/or processing techniques or capabilities for implementing or executing logic functions or programs. Processor **11** may include a single core or a multi core processor. Processor **11** includes the functionality for loading operating system **17** and operating any application programs **18** thereon. In some embodiments, Processor **11** can be provided in a microprocessing or a processing unit, such as, for example, Snapdragon processor produced by Qualcomm Inc., processor by Intel Corporation of Mountain View, Calif., processor manufactured by Motorola Corporation of Schaumburg, Ill.; processor manufactured by Transmeta Corporation of Santa Clara, Calif.; the RS/6000 processor, processor manufactured by International Business Machines of White Plains, N.Y.; processor manufactured by Advanced Micro Devices of Sunnyvale, Calif., or any computing unit for performing similar functions. In other embodiments, processor **11** can be provided in a graphics processing unit (GPU), visual processing unit (VPU), or other highly parallel processing unit or circuit such as, for example, nVidia GeForce line of GPUs, AMD Radeon line of GPUs, and/or others. Such GPUs or other highly parallel processing units may provide superior performance in processing operations on neural networks and/or other data structures. In further embodiments, processor **11** can be provided in a micro controller such as, for example, Texas instruments, Atmel, Microchip Technology, ARM, Silicon Labs, Intel, and/or other lines of micro controllers, and/or others. In further embodiments, processor **11** includes any circuit (i.e. logic circuit, etc.) or device for performing logic operations. Computing Device **70** can be based on one or more of the aforementioned or other processors capable of operating as described herein.

Memory **12** includes one or more memory chips capable of storing data and allowing any storage location to be accessed by processor **11** and/or other element. Examples of Memory **12** include static random access memory (SRAM), Flash memory, Burst SRAM or SynchBurst SRAM (BSRAM), Dynamic random access memory (DRAM), Fast Page Mode DRAM (FPM DRAM), Enhanced DRAM (EDRAM), Extended Data Output RAM (EDO RAM), Extended Data Output DRAM (EDO DRAM), Burst Extended Data Output DRAM (BEDO DRAM), Enhanced DRAM (EDRAM), synchronous DRAM (SDRAM), JEDEC SRAM, PC100 SDRAM, Double Data Rate SDRAM (DDR SDRAM), Enhanced SDRAM (ESDRAM), SyncLink DRAM (SLDRAM), Direct Rambus DRAM (DRDRAM), Ferroelectric RAM (FRAM), and/or others. Memory **12** can be based on any of the above described

memory chips, or any other available memory chips capable of operating as described herein. In some embodiments, processor **11** can communicate with memory **12** via a system bus **5**. In other embodiments, processor **11** can communicate directly with memory **12** via a memory port **10**.

Processor **11** can communicate directly with cache memory **14** via a connection means such as a secondary bus which may also sometimes be referred to as a backside bus. In some embodiments, processor **11** can communicate with cache memory **14** using the system bus **5**. Cache memory **14** may typically have a faster response time than main memory **12** and can include a type of memory which is considered faster than main memory **12**, such as for example SRAM, BSRAM, or EDRAM. Cache memory includes any structure such as multilevel caches, for example. In some embodiments, processor **11** can communicate with one or more I/O devices **13** via a system bus **5**. Various busses can be used to connect processor **11** to any of the I/O devices **13**, such as a VESA VL bus, an ISA bus, an EISA bus, a MicroChannel Architecture (MCA) bus, a PCI bus, a PCI-X bus, a PCI-Express bus, a NuBus, and/or others. In some embodiments, processor **11** can communicate directly with I/O device **13** via HyperTransport, Rapid I/O, or InfiniBand. In further embodiments, local busses and direct communication can be mixed. For example, processor **11** can communicate with an I/O device **13** using a local interconnect bus and communicate with another I/O device **13** directly. Similar configurations can be used for any other components described herein.

Computing Device **70** may further include alternative memory such as a SD memory slot, a USB memory stick, an optical drive such as a CD-ROM drive, a CD-R/RW drive, a DVD-ROM drive or a BlueRay disc, a hard-drive, and/or any other device comprising non-volatile memory suitable for storing data or installing application programs. Computing Device **70** may further include a storage device **27** comprising any type or form of non-volatile memory for storing an operating system (OS) such as any type or form of Windows OS, Mac OS, Unix OS, Linux OS, Android OS, iPhone OS, mobile version of Windows OS, an embedded OS, or any other OS that can operate on Computing Device **70**. Computing Device **70** may also include application programs **18**, and/or data space **19** for storing additional data or information. In some embodiments, alternative memory **16** can be used as or similar to storage device **27**. Additionally, OS **17** and/or application programs **18** can be operable from a bootable medium, such as for example, a flash drive, a micro SD card, a bootable CD or DVD, and/or other bootable medium.

Application Program **18** (also referred to as program, computer program, application, script, code, or other similar name or reference) comprises instructions that can provide functionality when executed by processor **11**. As such, Application Program **18** may be used to operate (i.e. perform operations on/with) or control a device or system. Application program **18** can be implemented in a high-level procedural or object-oriented programming language, or in a low-level machine or assembly language. Any language used can be compiled, interpreted, or otherwise translated into machine language. Application program **18** can be deployed in any form including as a stand-alone program or as a module, component, subroutine, or other unit suitable for use in a computing system. Application program **18** does not necessarily correspond to a file in a file system. A program can be stored in a portion of a file that may hold other programs or data, in a single file dedicated to the program, or in multiple files (i.e. files that store one or more modules, sub programs, or portions of code, etc.). Application Program **18** can be delivered in various forms such as, for example, executable file, library, script, plugin, addon, applet, interface, console application, web application, application service provider (ASP)-type application, operating system, and/or other forms. Application program **18** can be deployed to be executed on one computing device or on multiple computing devices (i.e. cloud, distributed, or parallel computing, etc.), or at one site or distributed across multiple sites interconnected by a communication network.

Network interface **25** can be utilized for interfacing Computing Device **70** with other devices via a network through a variety of connections including standard telephone lines, wired or wireless connections, LAN or WAN links (i.e. 802.11, T1, T3, 56 kb, X.25, etc.), broadband connections (i.e. ISDN, Frame Relay, ATM, etc.), or a combination thereof. Examples of networks include the Internet, an intranet, an extranet, a local area network (LAN), a wide area network (WAN), a personal area network (PAN), a home area network (HAN), a campus area network (CAN), a metropolitan area network (MAN), a global area network (GAN), a storage area network (SAN), virtual network, a virtual private network (VPN), Bluetooth network, a wireless network, a wireless LAN, a radio network, a HomePNA, a power line communication network, a G.hn network, an optical fiber network, an Ethernet network, an active networking network, a client-server network, a peer-to-peer network, a bus network, a star network, a ring network, a mesh network, a star-bus network, a tree network, a hierarchical topology network, and/or other networks. Network interface **25** may include a built-in network adapter, network interface card, PCMCIA network card, card bus network adapter, wireless network adapter, Bluetooth network adapter, WiFi network adapter, USB network adapter, modem, and/or any other device suitable for interfacing Computing Device **70** with any type of network capable of communication and/or operations described herein.

Still referring to FIG. **1**, I/O devices **13** may be present in various shapes or forms in Computing Device **70**. Examples of I/O device **13** capable of input include a joystick, a keyboard, a mouse, a trackpad, a trackpoint, a touchscreen, a trackball, a microphone, a drawing tablet, a glove, a tactile input device, a still or video camera, and/or other input device. Examples of I/O device **13** capable of output include a video display, a touchscreen, a projector, a glasses, a speaker, a tactile output device, and/or other output device. Examples of I/O device **13** capable of input and output include a disk drive, an optical storage device, a modem, a network card, and/or other input/output device. I/O device **13** can be interfaced with processor **11** via an I/O port **15**, for example. I/O device **13** can also be controlled by I/O control **22** in some implementations. I/O control **22** may control one or more I/O devices such as Human-machine Interface **23** (i.e. keyboard, pointing device, touchscreen, joystick, mouse, optical pen, etc.). I/O control **22** enables any type or form of a device such as, for example, a video camera or microphone to be interfaced with other components of Computing Device **70**. Furthermore, I/O device **13** may also provide storage such as or similar to storage **27**, and/or alternative memory such as or similar to alternative memory **16** in some implementations.

An output interface such as a graphical user interface, an acoustic output interface, a tactile output interface, any device driver (i.e. audio, video, or other driver), and/or other output interface or system can be utilized to process output from elements of Computing Device **70** for conveyance on

an output device such as Display **21**. In some aspects, Display **21** or other output device itself may include an output interface for processing output from elements of Computing Device **70**. Further, an input interface such as a keyboard listener, a touchscreen listener, a mouse listener, any device driver (i.e. audio, video, keyboard, mouse, touchscreen, or other driver), a speech recognizer, a video interpreter, and/or other input interface or system can be utilized to process input from Human-machine Interface **23** or other input device for use by elements of Computing Device **70**. In some aspects, Human-machine Interface **23** or other input device itself may include an input interface for processing input for use by elements of Computing Device **70**.

Computing Device **70** may include or be connected to multiple display devices **21**. Display devices **21** can each be of the same or different type or form. Computing Device **70** and/or its elements comprise any type or form of suitable hardware, programs, or a combination thereof to support, enable, or provide for the connection and use of multiple display devices **21**. In one example, Computing Device **70** includes any type or form of video adapter, video card, driver, and/or library to interface, communicate, connect, or otherwise use display devices **21**. In some aspects, a video adapter may include multiple connectors to interface to multiple display devices **21**. In other aspects, Computing Device **70** includes multiple video adapters, with each video adapter connected to one or more display devices **21**. In some embodiments, Computing Device's **70** operating system can be configured for using multiple displays **21**. In other embodiments, one or more display devices **21** can be provided by one or more other computing devices such as remote computing devices connected to Computing Device **70** via a network.

In some embodiments, I/O device **13** can be a bridge between system bus **5** and an external communication bus, such as a USB bus, an Apple Desktop Bus, an RS-232 serial connection, a SCSI bus, a FireWire bus, a FireWire 800 bus, an Ethernet bus, an AppleTalk bus, a Gigabit Ethernet bus, an Asynchronous Transfer Mode bus, a HIPPI bus, a Super HIPPI bus, a SerialPlus bus, a SCI/LAMP bus, a FibreChannel bus, a Serial Attached small computer system interface bus, and/or other bus.

Computing Device **70** can operate under the control of operating system **17**, which may support Computing Device's **70** basic functions, interface with and manage hardware resources, interface with and manage peripherals, provide common services for application programs, schedule tasks, and/or perform other functionalities. A modern operating system enables features and functionalities such as a high resolution display, graphical user interface (GUI), touchscreen, cellular network connectivity (i.e. mobile operating system, etc.), Bluetooth connectivity, WiFi connectivity, global positioning system (GPS) capabilities, mobile navigation, microphone, speaker, still picture camera, video camera, voice recorder, speech recognition, music player, video player, near field communication, personal digital assistant (PDA), and/or other features, functionalities, or applications. For example, Computing Device **70** can use any conventional operating system, any embedded operating system, any real-time operating system, any open source operating system, any video gaming operating system, any proprietary operating system, any online operating system, any operating system for mobile computing devices, or any other operating system capable of running on Computing Device **70** and performing operations described herein. Example of operating systems include Windows XP, Windows 7, Windows 8, etc. manufactured by Microsoft Corporation of Redmond, Wash.; Mac OS, iPhone OS, etc. manufactured by Apple Computer of Cupertino, Calif.; OS/2 manufactured by International Business Machines of Armonk, N.Y.; Linux, a freely-available operating system distributed by Caldera Corp. of Salt Lake City, Utah; or any type or form of a Unix operating system, among others. Any operating systems such as the ones for Android devices can similarly be utilized.

Computing Device **70** can be implemented as or be part of various different model architectures such as web services, distributed computing, grid computing, cloud computing, and/or other architectures. For example, in addition to the traditional desktop, server, or mobile operating system architectures, a cloud-based operating system can be utilized to provide the structure on which embodiments of the disclosure can be implemented. Other aspects of Computing Device **70** can also be implemented in the cloud without departing from the spirit and scope of the disclosure. For example, memory, storage, processing, and/or other elements can be hosted in the cloud. In some embodiments, Computing Device **70** can be implemented on multiple devices. For example, a portion of Computing Device **70** can be implemented on a mobile device and another portion can be implemented on wearable electronics.

Computing Device **70** can be or include any mobile device, a mobile phone, a smartphone (i.e. iPhone, Windows phone, Blackberry, Android phone, etc.), a tablet, a personal digital assistant (PDA), wearable electronics, implantable electronics, or another mobile device capable of implementing the functionalities described herein. In other embodiments, Computing Device **70** can be or include an embedded device, which can be any device or system with a dedicated function within another device or system. Embedded systems range from the simplest ones dedicated to one task with no user interface to complex ones with advanced user interface that may resemble modern desktop computer systems. Examples of devices comprising an embedded device include a mobile telephone, a personal digital assistant (PDA), a gaming device, a media player, a digital still or video camera, a pager, a television device, a set-top box, a personal navigation device, a global positioning system (GPS) receiver, a portable storage device (i.e. a USB flash drive, etc.), a digital watch, a DVD player, a printer, a microwave oven, a washing machine, a dishwasher, a gateway, a router, a hub, an automobile entertainment system, an automobile navigation system, a refrigerator, a washing machine, a factory automation device, an assembly line device, a factory floor monitoring device, a thermostat, an automobile, a factory controller, a telephone, a network bridge, and/or other devices. An embedded device can operate under the control of an operating system for embedded devices such as MicroC/OS-II, QNX, VxWorks, eCos, TinyOS, Windows Embedded, Embedded Linux, and/or other embedded device operating systems.

Various implementations of the disclosed devices, systems, and/or methods can be realized in digital electronic circuitry, integrated circuitry, logic gates, specially designed application specific integrated circuits (ASICs), field programmable gate arrays (FPGAs), computer hardware, firmware, programs, virtual machines, and/or combinations thereof including their structural, logical, and/or physical equivalents.

The disclosed devices, systems, and/or methods may include clients and servers. A client and server are generally remote from each other and typically interact via a network. The relationship of a client and server may arise by virtue of

computer programs running on their respective computers and having a client-server relationship to each other.

The disclosed devices, systems, and/or methods can be implemented in a computing system that includes a back end component, a middleware component, a front end component, or any combination thereof. The components of the system can be interconnected by any form or medium of digital data communication such as, for example, a network.

Computing Device **70** may include or be interfaced with a computer program product comprising instructions or logic encoded on a computer-readable medium. Such instructions or logic, when executed, may configure or cause a processor to perform the operations and/or functionalities disclosed herein. For example, a computer program can be provided or encoded on a computer-readable medium such as an optical medium (i.e. DVD-ROM, etc.), flash drive, hard drive, any memory, firmware, or other medium. Computer program can be installed onto a computing device to cause the computing device to perform the operations and/or functionalities disclosed herein. Machine-readable medium, computer-readable medium, or other such terms may refer to any computer program product, apparatus, and/or device for providing instructions and/or data to a programmable processor. As such, machine-readable medium includes any medium that can send or receive machine instructions as a machine-readable signal. Examples of a machine-readable medium include a volatile and/or non-volatile medium, a removable and/or non-removable medium, a communication medium, a storage medium, and/or other medium. A communication medium, for example, can transmit computer readable instructions and/or data in a modulated data signal such as a carrier wave or other transport technique, and may include any other form of information delivery medium known in art. A non-transitory machine-readable medium comprises all machine-readable media except for a transitory, propagating signal.

In some embodiments, the disclosed artificially intelligent devices, systems, and/or methods for learning and/or using visual surrounding for autonomous device operation, or elements thereof, can be implemented entirely or in part in a device (i.e. microchip, circuitry, logic gates, electronic device, computing device, special or general purpose processor, etc.) or system that comprises (i.e. hard coded, internally stored, etc.) or is provided with (i.e. externally stored, etc.) instructions for implementing VSADO functionalities. As such, the disclosed artificially intelligent devices, systems, and/or methods for learning and/or using visual surrounding for autonomous device operation, or elements thereof, may include the processing, memory, storage, and/or other features, functionalities, and embodiments of Computing Device **70** or elements thereof. Such device or system can operate on its own (i.e. standalone device or system, etc.), be embedded in another device or system (i.e. a television device, an oven, a refrigerator, a vehicle, an industrial machine, a robot, a smartphone, and/or any other device or system capable of housing the elements needed for VSADO functionalities), work in combination with other devices or systems, or be available in any other configuration. In other embodiments, the disclosed artificially intelligent devices, systems, and/or methods for learning and/or using visual surrounding for autonomous device operation, or elements thereof, may include Alternative Memory **16** that provides instructions for implementing VSADO functionalities to one or more Processors **11**. In further embodiments, the disclosed artificially intelligent devices, systems, and/or methods for learning and/or using visual surrounding for autonomous device operation, or elements thereof, can be implemented entirely or in part as a computer program and executed by one or more Processors **11**. Such program can be implemented in one or more modules or units of a single or multiple computer programs. Such program may be able to attach to or interface with, inspect, and/or take control of another application program to implement VSADO functionalities. In further embodiments, the disclosed artificially intelligent devices, systems, and/or methods for learning and/or using visual surrounding for autonomous device operation, or elements thereof, can be implemented as a network, web, distributed, cloud, or other such application accessed on one or more remote computing devices (i.e. servers, cloud, etc.) via Network Interface **25**, such remote computing devices including processing capabilities and instructions for implementing VSADO functionalities. In further embodiments, the disclosed artificially intelligent devices, systems, and/or methods for learning and/or using visual surrounding for autonomous device operation, or elements thereof, can be (1) attached to or interfaced with any computing device or application program, (2) included as a feature of an operating system, (3) built (i.e. hard coded, etc.) into any computing device or application program, and/or (4) available in any other configuration to provide its functionalities.

In yet other embodiments, the disclosed artificially intelligent devices, systems, and/or methods for learning and/or using visual surrounding for autonomous device operation, or elements thereof, can be implemented at least in part in a computer program such as Java application or program. Java provides a robust and flexible environment for application programs including flexible user interfaces, robust security, built-in network protocols, powerful application programming interfaces, database or DBMS connectivity and interfacing functionalities, file manipulation capabilities, support for networked applications, and/or other features or functionalities. Application programs based on Java can be portable across many devices, yet leverage each device's native capabilities. Java supports the feature sets of most smartphones and a broad range of connected devices while still fitting within their resource constraints. Various Java platforms include virtual machine features comprising a runtime environment for application programs. Java platforms provide a wide range of user-level functionalities that can be implemented in application programs such as displaying text and graphics, playing and recording audio content, displaying and recording visual content, communicating with another computing device, and/or other functionalities. It should be understood that the disclosed artificially intelligent devices, systems, and/or methods for learning and/or using visual surrounding for autonomous device operation, or elements thereof, are programming language, platform, and operating system independent. Examples of programming languages that can be used instead of or in addition to Java include C, C++, Cobol, Python, Java Script, Tcl, Visual Basic, Pascal, VB Script, Perl, PHP, Ruby, and/or other programming languages capable of implementing the functionalities described herein.

Where a reference to a specific file or file type is used herein, other files, file types, or formats can be substituted.

Where a reference to a data structure is used herein, it should be understood that any variety of data structures can be used such as, for example, array, list, linked list, doubly linked list, queue, tree, heap, graph, map, grid, matrix, multi-dimensional matrix, table, database, database management system (DBMS), file, neural network, and/or any other type or form of a data structure including a custom one. A

data structure may include one or more fields or data fields that are part of or associated with the data structure. A field or data field may include a data, an object, a data structure, and/or any other element or a reference/pointer thereto. A data structure can be stored in one or more memories, files, or other repositories. A data structure and/or any elements thereof, when stored in a memory, file, or other repository, may be stored in a different arrangement than the arrangement of the data structure and/or any elements thereof. For example, a sequence of elements can be stored in an arrangement other than a sequence in a memory, file, or other repository.

Where a reference to a repository is used herein, it should be understood that a repository may be or include one or more files or file systems, one or more storage locations or structures, one or more storage systems, one or more data structures or objects, one or more memory locations or structures, and/or other storage, memory, or data arrangements.

Where a reference to an interface is used herein, it should be understood that the interface comprises any hardware, device, system, program, method, and/or combination thereof that enable direct or operative coupling, connection, and/or interaction of the elements between which the interface is indicated. A line or arrow shown in the figures between any of the depicted elements comprises such interface. Examples of an interface include a direct connection, an operative connection, a wired connection (i.e. wire, cable, etc.), a wireless connection, a device, a network, a bus, a circuit, a firmware, a driver, a bridge, a program, a combination thereof, and/or others.

Where a reference to an element coupled or connected to another element is used herein, it should be understood that the element may be in communication or any other interactive relationship with the other element. Furthermore, an element coupled or connected to another element can be coupled or connected to any other element in alternate implementations. Terms coupled, connected, interfaced, or other such terms may be used interchangeably herein depending on context.

Where a reference to an element matching another element is used herein, it should be understood that the element may be equivalent or similar to the other element. Therefore, the term match or matching can refer to total equivalence or similarity depending on context.

Where a reference to a device is used herein, it should be understood that the device may include or be referred to as a system, and vice versa depending on context, since a device may include a system of elements and a system may be embodied in a device.

Where a mention of a function, method, routine, subroutine, or other such procedure is used herein, it should be understood that the function, method, routine, subroutine, or other such procedure comprises a call, reference, or pointer to the function, method, routine, subroutine, or other such procedure.

Where a mention of data, object, data structure, item, element, or thing is used herein, it should be understood that the data, object, data structure, item, element, or thing comprises a reference or pointer to the data, object, data structure, item, element, or thing.

The term collection of elements can refer to plurality of elements without implying that the collection is an element itself.

Referring to FIG. **2**, an embodiment of Device **98** comprising Unit for Learning and/or Using Visual Surrounding for Autonomous Device Operation (VSADO Unit **100**) is illustrated. Device **98** also comprises interconnected Processor **11**, Human-machine Interface **23**, Picture Capturing Apparatus **90**, Memory **12**, and Storage **27**. Processor **11** includes or executes Application Program **18**. VSADO Unit **100** comprises interconnected Artificial Intelligence Unit **110**, Acquisition Interface **120**, and Modification Interface **130**. Other additional elements can be included as needed, or some of the disclosed ones can be excluded, or a combination thereof can be utilized in alternate embodiments.

In one example, the teaching presented by the disclosure can be implemented in a device or system for learning and/or using visual surrounding for autonomous device operation. The device or system may include a processor circuit (i.e. Processor **11**, etc.) configured to execute instruction sets (i.e. Instruction Sets **526**, etc.) for operating a device. The device or system may further include a memory unit (i.e. Memory **12**, etc.) configured to store data. The device or system may further include a picture capturing apparatus (i.e. Picture Capturing Apparatus **90**, etc.) configured to capture digital pictures (i.e. Digital Pictures **525**, etc.). The device or system may further include an artificial intelligence unit (i.e. Artificial Intelligence Unit **110**, etc.). The artificial intelligence unit may be configured to receive a first digital picture from the picture capturing apparatus. The artificial intelligence unit may also be configured to receive one or more instruction sets for operating the device from the processor circuit. The artificial intelligence unit may also be configured to learn the first digital picture correlated with the one or more instruction sets for operating the device. The artificial intelligence unit may also be configured to receive a new digital picture from the picture capturing apparatus. The artificial intelligence unit may also be configured to anticipate the one or more instruction sets for operating the device correlated with the first digital picture based on at least a partial match between the new digital picture and the first digital picture. The artificial intelligence unit may also be configured to cause the processor circuit to execute the one or more instruction sets for operating the device correlated with the first digital picture, the executing performed in response to the anticipating of the artificial intelligence unit, wherein the device performs one or more operations defined by the one or more instruction sets for operating the device correlated with the first digital picture, the one or more operations performed in response to the executing by the processor circuit. Any of the operations of the described elements can be performed repeatedly and/or in different orders in alternate embodiments. In some embodiments, a stream of digital pictures can be used instead of or in addition to any digital picture such as, for example, using a first stream of digital pictures instead of the first digital picture. In other embodiments, a logic circuit (i.e. Logic Circuit **250**, etc.) may be used instead of the processor circuit. In such embodiments, the one or more instruction sets for operating the device may include or be substituted with one or more inputs into or one or more outputs from the logic circuit. In further embodiments, an actuator may be included instead of or in addition to the processor circuit. In such embodiments, the one or more instruction sets for operating the device may include or be substituted with one or more inputs into the actuator. Other additional elements can be included as needed, or some of the disclosed ones can be excluded, or a combination thereof can be utilized in alternate embodiments. The device or system for learning and/or using visual surrounding for autonomous device operation may include any actions or operations of any of the disclosed methods such as methods **6100**, **6200**, **6300**, **6400**, **6500**, and/or **6600** (all later described).

Device **98** comprises any hardware, programs, or a combination thereof. Device **98** may include a system. Device **98** may include any features, functionalities, and embodiments of Computing Device **70**, or elements thereof. Examples of Device **98** include a desktop or other computer, a smartphone or other mobile computer, a vehicle, an industrial machine, a toy, a robot, a microwave or other oven, and/or any other device or machine comprising processing capabilities. Such device or machine may be built for any function or purpose examples of which are described later.

User **50** (also referred to simply as user or other similar name or reference) comprises a human user or non-human user. A non-human User **50** includes any device, system, program, and/or other mechanism for operating or controlling Device **98** and/or elements thereof. In one example, User **50** may issue an operating direction to Application Program **18** responsive to which Application Program's **18** instructions or instruction sets may be executed by Processor **11** to perform a desired operation on Device **98**. In another example, User **50** may issue an operating direction to Processor **11**, Logic Circuit **250** (later described), and/or other processing element responsive to which Processor **11**, Logic Circuit **250**, and/or other processing element may implement logic to perform a desired operation on Device **98**. User's **50** operating directions comprise any user inputted data (i.e. values, text, symbols, etc.), directions (i.e. move right, move up, move forward, copy an item, click on a link, etc.), instructions or instruction sets (i.e. manually inputted instructions or instruction sets, etc.), and/or other inputs or information. A non-human User **50** can utilize more suitable interfaces instead of, or in addition to, Human-machine Interface **23** and/or Display **21** for controlling Device **98** and/or elements thereof. Examples of such interfaces include an application programming interface (API), bridge (i.e. bridge between applications, devices, or systems, etc.), driver, socket, direct or operative connection, handle, function/routine/subroutine, and/or other interfaces.

In some embodiments, Processor **11**, Logic Circuit **250**, Application Program **18**, and/or other processing element may control or affect an actuator (not shown). Actuator comprises the functionality for implementing movements, actions, behaviors, maneuvers, and/or other mechanical or physical operations. Device **98** may include one or more actuators to enable Device **98** to perform mechanical, physical, or other operations and/or to interact with its environment. For example, an actuator can be connected to or coupled to an element such as a wheel, arm, or other element to act upon the environment. Examples of an actuator include a motor, a linear motor, a servomotor, a hydraulic element, a pneumatic element, an electro-magnetic element, a spring element, and/or other actuators. Examples of types of actuators include a rotary actuator, a linear actuator, and/or other types of actuators. In other embodiments, Processor **11**, Logic Circuit **250**, Application Program **18**, and/or other processing element may control or affect any other device or element instead of or in addition to an actuator.

Picture Capturing Apparatus **90** comprises the functionality for capturing one or more pictures, and/or other functionalities. As such, Picture Capturing Apparatus **90** can be used to capture pictures of Device's **98** surrounding. In some embodiments, Picture Capturing Apparatus **90** may be or comprises a motion picture camera that can capture streams of pictures (i.e. motion pictures, videos, etc.). In other embodiments, Picture Capturing Apparatus **90** may be or comprises a still picture camera that can capture still pictures (i.e. photographs, etc.). In further embodiments, Picture Capturing Apparatus **90** may be or comprises any other picture capturing apparatus. In general, Picture Capturing Apparatus **90** may capture any light (i.e. visible light, infrared light, ultraviolet light, x-ray light, etc.) across the electromagnetic spectrum onto a light-sensitive material. In one example, a digital Picture Capturing Apparatus **90** can utilize a charge coupled device (CCD), a CMOS sensor, and/or other electronic image sensor to capture digital pictures that can then be stored in a memory or storage, or transmitted to an element such as Artificial Intelligence Unit **110**. In another example, analog Picture Capturing Apparatus **90** can utilize an analog-to-digital converter to produce digital pictures. In some embodiments, Picture Capturing Apparatus **90** can be built, embedded, or integrated in Device **98**, VSADO Unit **100**, and/or other disclosed element. In other embodiments, Picture Capturing Apparatus **90** can be an external Picture Capturing Apparatus **90** connected with Device **98**, VSADO Unit **100**, and/or other disclosed element. In further embodiments, Picture Capturing Apparatus **90** comprises Computing Device **70** or elements thereof. In general, Picture Capturing Apparatus **90** can be implemented in any suitable configuration to provide its functionalities. Picture Capturing Apparatus **90** may capture one or more Digital Pictures **525**. Digital Picture **525** (also referred to simply as digital pictures, etc.) may include a collection of color encoded pixels or dots. Examples of file formats that can be utilized to store Digital Picture **525** include JPEG, GIF, TIFF, PNG, PDF, and/or other file formats. A stream of Digital Pictures **525** (i.e. motion picture, video, etc.) may include one or more Digital Pictures **525**. Examples of file formats that can be utilized to store a stream of Digital Pictures **525** include MPEG, AVI, FLV, MOV, RM, SWF, WMV, DivX, and/or other file formats. In some aspects, Digital Picture **525** may include or be substituted with a stream of Digital Pictures **525**, and vice versa. Therefore, the terms digital picture and stream of digital pictures may be used interchangeably herein depending on context. In some aspects, Device's **98** surrounding may include exterior of Device **98**. In other aspects, Device's **98** surrounding may include interior of Device **98** in case of hollow Device **98**, Device **98** comprising compartments or openings, and/or other variously shaped Device **98**.

VSADO Unit **100** comprises any hardware, programs, or a combination thereof. VSADO Unit **100** comprises the functionality for learning the operation of Device **98** in various visual surroundings. VSADO Unit **100** comprises the functionality for structuring and/or storing this knowledge in a knowledgebase (i.e. neural network, graph, sequences, other repository, etc.). VSADO Unit **100** comprises the functionality for enabling autonomous operation of Device **98** in various visual surroundings. VSADO Unit **100** comprises the functionality for interfacing with or attaching to Application Program **18**, Processor **11**, Logic Circuit **250**, and/or other processing element. VSADO Unit **100** comprises the functionality for obtaining instruction sets, data, and/or other information used, implemented, and/or executed by Application Program **18**, Processor **11**, Logic Circuit **250**, and/or other processing element. VSADO Unit **100** comprises the functionality for modifying instruction sets, data, and/or other information used, implemented, and/or executed by Application Program **18**, Processor **11**, Logic Circuit **250**, and/or other processing element. VSADO Unit **100** comprises learning, anticipating, decision making, automation, and/or other functionalities disclosed herein. Statistical, artificial intelligence, machine learning, and/or

other models or techniques are utilized to implement the disclosed devices, systems, and methods.

When the disclosed VSADO Unit **100** functionalities are applied on Application Program **18**, Processor **11**, Logic Circuit **250** (later described), and/or other processing element of Device **98**, Device **98** may become autonomous. VSADO Unit **100** may take control from, share control with, and/or release control to Application Program **18**, Processor **11**, Logic Circuit **250**, and/or other processing element to implement autonomous operation of Device **98**. VSADO Unit **100** may take control from, share control with, and/or release control to Application Program **18**, Processor **11**, Logic Circuit **250**, and/or other processing element automatically or after prompting User **50** to allow it. In some aspects, Application Program **18**, Processor **11**, Logic Circuit **250**, and/or other processing element of an autonomous Device **98** may include or be provided with anticipatory instructions or instruction sets that User **50** did not issue or cause to be executed. Such anticipatory instructions or instruction sets include instruction sets that User **50** may want or is likely to issue or cause to be executed. Anticipatory instructions or instruction sets can be generated by VSADO Unit **100** or elements thereof based on the visual surrounding of Device **98**. As such, Application Program **18**, Processor **11**, Logic Circuit **250**, and/or other processing element of an autonomous Device **98** may include or be provided with some or all original instructions or instruction sets and/or any anticipatory instructions or instruction sets generated by VSADO Unit **100**. Therefore, autonomous Device **98** operating may include executing some or all original instructions or instruction sets and/or any anticipatory instructions or instruction sets generated by VSADO Unit **100**. In one example, VSADO Unit **100** can overwrite or rewrite the original instructions or instruction sets of Application Program **18**, Processor **11**, Logic Circuit **250**, and/or other processing element with VSADO Unit **100**-generated instructions or instruction sets. In another example, VSADO Unit **100** can insert or embed VSADO Unit **100**-generated instructions or instruction sets among the original instructions or instruction sets of Application Program **18**, Processor **11**, Logic Circuit **250**, and/or other processing element. In a further example, VSADO Unit **100** can branch, redirect, or jump to VSADO Unit **100**-generated instructions or instruction sets from the original instructions or instruction sets of Application Program **18**, Processor **11**, Logic Circuit **250**, and/or other processing element.

In some embodiments, autonomous Device **98** operating comprises determining, by VSADO Unit **100**, a next instruction or instruction set to be executed based on Device's **98** visual surrounding prior to the user issuing or causing to be executed the next instruction or instruction set. In yet other embodiments, autonomous application operating comprises determining, by VSADO Unit **100**, a next instruction or instruction set to be executed based on Device's **98** visual surrounding prior to the system receiving the next instruction or instruction set.

In some embodiments, autonomous Device **98** operating includes a partially or fully autonomous operating. In an example involving partially autonomous Device **98** operating, a user confirms VSADO Unit **100**-generated instructions or instruction sets prior to their execution. In an example involving fully autonomous application operating, VSADO Unit **100**-generated instructions or instruction sets are executed without user or other system confirmation (i.e. automatically, etc.).

In some embodiments, a combination of VSADO Unit **100** and other systems and/or techniques can be utilized to implement Device's **98** operation. In one example, VSADO Unit **100** may be a primary or preferred system for implementing Device's **98** operation. While operating autonomously under the control of VSADO Unit **100**, Device **98** may encounter a visual surrounding that has not been encountered or learned before. In such situations, User **50** and/or non-VSADO system may take control of Device's **98** operation. VSADO Unit **100** may take control again when Device **98** encounters a previously learned visual surrounding. Naturally, VSADO Unit **100** can learn Device's **98** operation in visual surroundings while User **50** and/or non-VSADO system is in control of Device **98**, thereby reducing or eliminating the need for future involvement of User **50** and/or non-VSADO system. In another example, User **50** and/or non-VSADO system may be a primary or preferred system for control of Device's **98** operation. While operating under the control of User **50** and/or non-VSADO system, User **50** and/or non-VSADO system may release control to VSADO Unit **100** for any reason (i.e. User **50** gets tired or distracted, non-VSADO system gets stuck or cannot make a decision, etc.), at which point Device **98** can be controlled by VSADO Unit **100**. In some designs, VSADO Unit **100** may take control in certain special visual surroundings where VSADO Unit **100** may offer superior performance even though User **50** and/or non-VSADO system may generally be preferred. Once Device **98** leaves such special visual surrounding, VSADO Unit **100** may release control to User **50** and/or a non-VSADO system. In general, VSADO Unit **100** can take control from, share control with, or release control to User **50**, non-VSADO system, and/or other system or process at any time, under any circumstances, and remain in control for any period of time as needed.

In some embodiments, VSADO Unit **100** may control one or more sub-devices, sub-systems, or elements of Device **98** while User **50** and/or non-VSADO system may control other one or more sub-devices, sub-systems, or elements of Device **98**.

It should be understood that a reference to autonomous operating of Device **98** may include autonomous operating of Application Program **18**, Processor **11**, Logic Circuit **250**, and/or other processing element depending on context.

Acquisition Interface **120** comprises the functionality for obtaining or receiving instruction sets, data, and/or other information. Acquisition Interface **120** comprises the functionality for obtaining or receiving instruction sets, data, and/or other information from Processor **11**, Application Program **18**, Logic Circuit **250** (later described), and/or other processing element. Acquisition Interface **120** comprises the functionality for obtaining or receiving instruction sets, data, and/or other information at runtime. In some aspects, an instruction set may include any computer command, instruction, signal, or input used in Application Program **18**, Processor **11**, Logic Circuit **250**, and/or other processing element. Therefore, the terms instruction set, command, instruction, signal, input, or other such terms may be used interchangeably herein depending on context. Acquisition Interface **120** also comprises the functionality for attaching to or interfacing with Application Program **18**, Processor **11**, Logic Circuit **250**, and/or other processing element. In one example, Acquisition Interface **120** comprises the functionality to access and/or read runtime engine/environment, virtual machine, operating system, compiler, just-in-time (JIT) compiler, interpreter, translator, execution stack, file, object, data structure, and/or other computing system elements. In another example, Acquisition Interface **120** comprises the functionality to access and/or read

memory, storage, bus, interfaces, and/or other computing system elements. In a further example, Acquisition Interface **120** comprises the functionality to access and/or read Processor **11** registers and/or other Processor **11** elements. In a further example, Acquisition Interface **120** comprises the functionality to access and/or read inputs and/or outputs of Application Program **18**, Processor **11**, Logic Circuit **250**, and/or other processing element. In a further example, Acquisition Interface **120** comprises the functionality to access and/or read functions, methods, procedures, routines, subroutines, and/or other elements of Application Program **18**. In a further example, Acquisition Interface **120** comprises the functionality to access and/or read source code, bytecode, compiled, interpreted, or otherwise translated code, machine code, and/or other code. In a further example, Acquisition Interface **120** comprises the functionality to access and/or read values, variables, parameters, and/or other data or information. Acquisition Interface **120** also comprises the functionality for transmitting the obtained instruction sets, data, and/or other information to Artificial Intelligence Unit **110** and/or other element. As such, Acquisition Interface **120** provides input into Artificial Intelligence Unit **110** for knowledge structuring, anticipating, decision making, and/or other functionalities later in the process. Acquisition Interface **120** also comprises other disclosed functionalities.

Acquisition Interface **120** can employ various techniques for obtaining instruction sets, data, and/or other information. In one example, Acquisition Interface **120** can attach to and/or obtain Processor's **11**, Application Program's **18**, Logic Circuit's **250**, and/or other processing element's instruction sets, data, and/or other information through tracing or profiling techniques. Tracing or profiling may be used for outputting Processor's **11**, Application Program's **18**, Logic Circuit's **250**, and/or other processing element's instruction sets, data, and/or other information at runtime. For instance, tracing or profiling may include adding trace code (i.e. instrumentation, etc.) to an application and/or outputting trace information to a specific target. The outputted trace information (i.e. instruction sets, data, and/or other information, etc.) can then be provided to or recorded into a file, data structure, repository, an application, and/or other system or target that may receive such trace information. As such, Acquisition Interface **120** can utilize tracing or profiling to obtain instruction sets, data, and/or other information and provide them as input into Artificial Intelligence Unit **110**. In some aspects, instrumentation can be performed in source code, bytecode, compiled, interpreted, or otherwise translated code, machine code, and/or other code. In other aspects, instrumentation can be performed in various elements of a computing system such as memory, virtual machine, runtime engine/environment, operating system, compiler, interpreter, translator, processor registers, execution stack, program counter, and/or other elements. In yet other aspects, instrumentation can be performed in various abstraction layers of a computing system such as in software layer (i.e. Application Program **18**, etc.), in virtual machine (if VM is used), in operating system, in Processor **11**, and/or in other layers or areas that may exist in a particular computing system implementation. In yet other aspects, instrumentation can be performed at various time periods in an application's execution such as source code write time, compile time, interpretation time, translation time, linking time, loading time, runtime, and/or other time periods. In yet other aspects, instrumentation can be performed at various granularities or code segments such as some or all lines of code, some or all statements, some or all instructions or instruction sets, some or all basic blocks, some or all functions/routines/subroutines, and/or some or all other code segments.

In some embodiments, Application Program **18** can be automatically instrumented. In one example, Acquisition Interface **120** can access Application Program's **18** source code, bytecode, or machine code and select instrumentation points of interest. Selecting instrumentation points may include finding locations in the source code, bytecode, or machine code corresponding to function calls, function entries, function exits, object creations, object destructions, event handler calls, new lines (i.e. to instrument all lines of code, etc.), thread creations, throws, and/or other points of interest. Instrumentation code can then be inserted at the instrumentation points of interest to output Application Program's **18** instruction sets, data, and/or other information. In response to executing instrumentation code, Application Program's **18** instruction sets, data, and/or other information may be received by Acquisition Interface **120**. In some aspects, Application Program's **18** source code, bytecode, or machine code can be dynamically instrumented. For example, instrumentation code can be dynamically inserted into Application Program **18** at runtime.

In other embodiments, Application Program **18** can be manually instrumented. In one example, a programmer can instrument a function call by placing an instrumenting instruction immediately after the function call as in the following example.

```
Object1.moveRight(73);
traceApplication('Object1.moveRight(73);');
```

In another example, an instrumenting instruction can be placed immediately before the function call, or at the beginning, end, or anywhere within the function itself. A programmer may instrument all function calls or only function calls of interest. In a further example, a programmer can instrument all lines of code or only code lines of interest. In a further example, a programmer can instrument other elements utilized or implemented within Application Program **18** such as objects and/or any of their functions, data structures and/or any of their functions, event handlers and/or any of their functions, threads and/or any of their functions, and/or other elements or functions. Similar instrumentation as in the preceding examples can be performed automatically or dynamically. In some designs where manual code instrumentation is utilized, Acquisition Interface **120** can optionally be omitted and Application Program's **18** instruction sets, data, and/or other information may be transmitted directly to Artificial Intelligence Unit **110**.

In some embodiments, VSADO Unit **100** can be selective in learning instruction sets, data, and/or other information to those implemented, utilized, or related to an object, data structure, repository, thread, function, and/or other element of Application Program **18**. In some aspects, Acquisition Interface **120** can obtain Application Program's **18** instruction sets, data, and/or other information implemented, utilized, or related to a certain object in an object oriented Application Program **18**.

In some embodiments, various computing systems and/or platforms may provide native tools for obtaining instruction sets, data, and/or other information. Also, independent vendors may provide portable tools with similar functionalities that can be utilized across different computing systems and/or platforms. These native and portable tools may provide a wide range of functionalities to obtain runtime and other information such as instrumentation, tracing or profiling, logging application or system messages, outputting

custom text messages, outputting objects or data structures, outputting functions/routines/subroutines or their invocations, outputting variable or parameter values, outputting thread or process behaviors, outputting call or other stacks, outputting processor registers, providing runtime memory access, providing inputs and/or outputs, performing live application monitoring, and/or other capabilities. One of ordinary skill in art will understand that, while all possible variations of the techniques to obtain instruction sets, data, and/or other information are too voluminous to describe, these techniques are within the scope of this disclosure.

In one example, obtaining instruction sets, data, and/or other information can be implemented through the .NET platform's native tools for application tracing or profiling such as System.Diagnostics.Trace, System.Diagnostics.Debug, and System.Diagnostics.TraceSource classes for tracing execution flow, and System. Diagnostics. Process, System.Diagnostics.EventLog, and System. Diagnostics. PerformanceCounter classes for profiling code, accessing local and remote processes, starting and stopping system processes, and interacting with Windows event logs, etc. For instance, a set of trace switches can be created that output an application's information. The switches can be configured using the .config file. For a Web application, this may typically be Web.config file associated with the project. In a Windows application, this file may typically be named applicationName.exe.config. Trace code can be added to application code automatically or manually as previously described. Appropriate listener can be created where the trace output is received. Trace code may output trace messages to a specific target such as a file, a log, a database, an object, a data structure, and/or other repository or system. Acquisition Interface **120** or Artificial Intelligence Unit **110** can then read or obtain the trace information from these targets. In some aspects, trace code may output trace messages directly to Acquisition Interface **120**. In other aspects, trace code may output trace messages directly to Artificial Intelligence Unit **110**. In the case of outputting trace messages to Acquisition Interface **120** or directly to Artificial Intelligence Unit **110**, custom listeners can be built to accommodate these specific targets. Other platforms, tools, and/or techniques can provide equivalent or similar functionalities as the above described ones.

In another example, obtaining instruction sets, data, and/or other information can be implemented through the .NET platform's Profiling API that can be used to create a custom profiler application for tracing, monitoring, interfacing with, and/or managing a profiled application. The Profiling API provides an interface that includes methods to notify the profiler of events in the profiled application. The Profiling API may also provide an interface to enable the profiler to call back into the profiled application to obtain information about the state of the profiled application. The Profiling API may further provide call stack profiling functionalities. Call stack (also referred to as execution stack, control stack, runtime stack, machine stack, the stack, etc.) includes a data structure that can store information about active subroutines of an application. The Profiling API may provide a stack snapshot method, which enables a trace of the stack at a particular point in time. The Profiling API may also provide a shadow stack method, which tracks the call stack at every instant. A shadow stack can obtain function arguments, return values, and information about generic instantiations. A function such as FunctionEnter can be utilized to notify the profiler that control is being passed to a function and can provide information about the stack frame and function arguments. A function such as FunctionLeave can be utilized to notify the profiler that a function is about to return to the caller and can provide information about the stack frame and function return value. An alternative to call stack profiling includes call stack sampling in which the profiler can periodically examine the stack. In some aspects, the Profiling API enables the profiler to change the in-memory code stream for a routine before it is just-in-time (JIT) compiled where the profiler can dynamically add instrumentation code to all or particular routines of interest. Other platforms, tools, and/or techniques may provide equivalent or similar functionalities as the above described ones.

In a further example, obtaining instruction sets, data, and/or other information can be implemented through Java platform's APIs for application tracing or profiling such as Java Virtual Machine Profiling Interface (JVMPI), Java Virtual Machine Tool Interface (JVMTI), and/or other APIs or tools. These APIs can be used for instrumentation of an application, for notification of Java Virtual Machine (VM) events, and/or other functionalities. One of the tracing or profiling techniques that can be utilized includes bytecode instrumentation. The profiler can insert bytecodes into all or some of the classes. In application execution profiling, for example, these bytecodes may include methodEntry and methodExit calls. In memory profiling, for example, the bytecodes may be inserted after each new or after each constructor. In some aspects, insertion of instrumentation bytecode can be performed either by a post-compiler or a custom class loader. An alternative to bytecode instrumentation includes monitoring events generated by the JVMPI or JVMTI interfaces. Both APIs can generate events for method entry/exit, object allocation, and/or other events. In some aspects, JVMTI can be utilized for dynamic bytecode instrumentation where insertion of instrumentation bytecodes is performed at runtime. The profiler may insert the necessary instrumentation when a selected class is invoked in an application. This can be accomplished using the JVMTI's redefineClasses method, for example. This approach also enables changing of the level of profiling as the application is running. If needed, these changes can be made adaptively without restarting the application. Other platforms, tools, and/or techniques may provide equivalent or similar functionalities as the above described ones.

In a further example, obtaining instruction sets, data, and/or other information can be implemented through JVMTI's programming interface that enables creation of software agents that can monitor and control a Java application. An agent may use the functionality of the interface to register for notification of events as they occur in the application, and to query and control the application. A JVMTI agent may use JVMTI functions to extract information from a Java application. A JVMTI agent can be utilized to obtain an application's runtime information such as method calls, memory allocation, CPU utilization, lock contention, and/or other information. JVMTI may include functions to obtain information about variables, fields, methods, classes, and/or other information. JVMTI may also provide notification for numerous events such as method entry and exit, exception, field access and modification, thread start and end, and/or other events. Examples of JVMTI built-in methods include GetMethodName to obtain the name of an invoked method, GetThreadInfo to obtain information for a specific thread, GetClassSignature to obtain information about the class of an object, GetStackTrace to obtain information about the stack including information about stack frames, and/or other methods. Other platforms, tools, and/or techniques may provide equivalent or similar functionalities as the above described ones.

In a further example, obtaining instruction sets, data, and/or other information can be implemented through java-.lang.Runtime class that provides an interface for application tracing or profiling. Examples of methods provided in java-.lang.Runtime that can be used to obtain an application's instruction sets, data, and/or other information include tracemethodcalls, traceinstructions, and/or other methods. These methods prompt the Java Virtual Machine to output trace information for a method or instruction in the virtual machine as it is executed. The destination of trace output may be system dependent and include a file, a listener, and/or other destinations where Acquisition Interface **120**, Artificial Intelligence Unit **110**, and/or other disclosed elements can access needed information. In addition to tracing or profiling tools native to their respective computing systems and/or platforms, many independent tools exist that provide tracing or profiling functionalities on more than one computing system and/or platform. Examples of these tools include Pin, DynamoRIO, KernInst, DynInst, Kprobes, OpenPAT, DTrace, SystemTap, and/or others. Other platforms, tools, and/or techniques may provide equivalent or similar functionalities as the above described ones.

In a further example, obtaining instruction sets, data, and/or other information can be implemented through logging tools of the platform and/or operating system on which an application runs. Some logging tools may include nearly full feature sets of the tracing or profiling tools previously described. In one example, Visual Basic enables logging of runtime messages through its Microsoft.VisualBasic.Logging namespace that provides a log listener where the log listener may direct logging output to a file and/or other target. In another example, Java enables logging through its java.util.logging class. In some aspects, obtaining an application's instruction sets, data, and/or other information can be implemented through logging capabilities of the operating system on which an application runs. For example, Windows NT features centralized log service that applications and operating-system components can utilize to report their events including any messages. Windows NT provides functionalities for system, application, security, and/or other logging. An application log may include events logged by applications. Windows NT, for example, may include support for defining an event source (i.e. application that created the event, etc.). Windows Vista, for example, supports a structured XML log-format and designated log types to allow applications to more precisely log events and to help interpret the events. Examples of different types of event logs include administrative, operational, analytic, debug, and/or other log types including any of their subcategories. Examples of event attributes that can be utilized include eventID, level, task, opcode, keywords, and/or other event attributes. Windows wevtutil tool enables access to events, their structures, registered event publishers, and/or their configuration even before the events are fired. Wevtutil supports capabilities such as retrieval of the names of all logs on a computing device; retrieval of configuration information for a specific log; retrieval of event publishers on a computing device; reading events from an event log, from a log file, or using a structured query; exporting events from an event log, from a log file, or using a structured query to a specific target; and/or other capabilities. Operating system logs can be utilized solely if they contain sufficient information on an application's instruction sets, data, and/or other information. Alternatively, operating system logs can be utilized in combination with another source of information (i.e. trace information, call stack, processor registers, memory, etc.) to reconstruct the application's instruction sets, data, and/or other information needed for Artificial Intelligence Unit **110** and/or other elements. In addition to logging capabilities native to their respective platforms and/or operating systems, many independent tools exist that provide logging on different platforms and/or operating systems. Examples of these tools include Log 4j, Logback, SmartInspect, NLog, log 4net, Microsoft Enterprise Library, ObjectGuy Framework, and/or others. Other platforms, tools, and/or techniques may provide equivalent or similar functionalities as the above described ones.

In a further example, obtaining instruction sets, data, and/or other information can be implemented through tracing or profiling the operating system on which an application runs. As in tracing or profiling an application, one of the techniques that can be utilized includes adding instrumentation code to the operating system's source code. Such instrumentation code can be added to the operating system's source code before kernel compilation or recompilation, for instance. This type of instrumentation may involve defining or finding locations in the operating system's source code where instrumentation code may be inserted. Kernel instrumentation can also be performed without the need for kernel recompilation or rebooting. In some aspects, instrumentation code can be added at locations of interest through binary rewriting of compiled kernel code. In other aspects, kernel instrumentation can be performed dynamically where instrumentation code is added and/or removed where needed at runtime. For instance, dynamic instrumentation may overwrite kernel code with a branch instruction that redirects execution to instrumentation code or instrumentation routine. In yet other aspects, kernel instrumentation can be performed using just-in-time (JIT) dynamic instrumentation where execution may be redirected to a copy of kernel's code segment that includes instrumentation code. This type of instrumentation may include a JIT compiler and creation of a copy of the original code segment having instrumentation code or calls to instrumentation routines embedded into the original code segment. Instrumentation of the operating system may enable total system visibility including visibility into an application's behavior by enabling generation of low level trace information. Other platforms, tools, and/or techniques may provide equivalent or similar functionalities as the above described ones.

In a further example, obtaining instruction sets, data, and/or other information can be implemented through tracing or profiling the processor on which an application runs. For example, some Intel processors provide Intel Processor Trace (i.e. Intel PT, etc.), a low-level tracing feature that enables recording executed instruction sets, and/or other data or information of one or more applications. Intel PT is facilitated by the Processor Trace Decoder Library along with its related tools. Intel PT is a low-overhead execution tracing feature that records information about application execution on each hardware thread using dedicated hardware facilities. The recorded execution/trace information is collected in data packets that can be buffered internally before being sent to a memory subsystem or another system or element (i.e. Acquisition Interface **120**, Artificial Intelligence Unit **110**, etc.). Intel PT also enables navigating the recorded execution/trace information via reverse stepping commands. Intel PT can be included in an operating system's core files and provided as a feature of the operating system. Intel PT can trace globally some or all applications running on an operating system. Acquisition Interface **120** or Artificial Intelligence Unit **110** can read or obtain the recorded execution/trace information from Intel PT. Other

platforms, tools, and/or techniques may provide equivalent or similar functionalities as the above described ones.

In a further example, obtaining instruction sets, data, and/or other information can be implemented through branch tracing or profiling. Branch tracing may include an abbreviated instruction trace in which only the successful branch instruction sets are traced or recorded. Branch tracing can be implemented through utilizing dedicated processor commands, for example. Executed branches may be saved into special branch trace store area of memory. With the availability and reference to a compiler listing of the application together with branch trace information, a full path of executed instruction sets can be reconstructed. The full path can also be reconstructed with a memory dump (containing the program storage) and branch trace information. In some aspects, branch tracing can be utilized for pre-learning or automated learning of an application's instruction sets, data, and/or other information where a number of application simulations (i.e. simulations of likely/common operations, etc.) are performed. As such, the application's operation can be learned automatically saving the time that would be needed to learn the application's operation directed by a user. Other platforms, tools, and/or techniques may provide equivalent or similar functionalities as the above described ones.

In a further example, obtaining instruction sets, data, and/or other information can be implemented through assembly language. Assembly language is a low-level programming language for a computer or other programmable device in which there is a strong correlation between the language and the architecture's machine instruction sets. Syntax, addressing modes, operands, and/or other elements of an assembly language instruction set may translate directly into numeric (i.e. binary, etc.) representations of that particular instruction set. Because of this direct relationship with the architecture's machine instruction sets, assembly language can be a powerful tool for tracing or profiling an application's execution in processor registers, memory, and/or other computing system components. For example, using assembly language, memory locations of a loaded application can be accessed, instrumented, and/or otherwise manipulated. In some aspects, assembly language can be used to rewrite or overwrite original in-memory instruction sets of an application with instrumentation instruction sets. In other aspects, assembly language can be used to redirect application's execution to instrumentation routine/subroutine or other code segment elsewhere in memory by inserting a jump into the application's in-memory code, by redirecting program counter, or by other techniques. Some operating systems may implement protection from changes to applications loaded into memory. Operating system, processor, or other low level commands such as Linux mprotect command or similar commands in other operating systems may be used to unprotect the protected locations in memory before the change. In yet other aspects, assembly language can be used to obtain instruction sets, data, and/or other information through accessing and/or reading instruction register, program counter, other processor registers, memory locations, and/or other components of a computing system. In yet other aspects, high-level programming languages may call or execute an external assembly language program to facilitate obtaining instruction sets, data, and/or other information as previously described. In yet other aspects, relatively low-level programming languages such as C may allow embedding assembly language directly in their source code such as, for example, using asm keyword of C. Other platforms, tools, and/or techniques may provide equivalent or similar functionalities as the above described ones.

In a further example, it may be sufficient to obtain user or other inputs, variables, parameters, and/or other data in some procedural, simple object oriented, or other applications. In one instance, a simple procedural application executes a sequence of instruction sets until the end of the program. During its execution, the application may receive user or other input, store the input in a variable, and perform calculations using the variable to reach a result. The value of the variable can be obtained or traced. In another instance, a more complex procedural application comprises one or more functions/routines/subroutines each of which may include a sequence of instruction sets. The application may execute a main sequence of instruction sets with a branch to a function/routine/subroutine. During its execution, the application may receive user or other input, store the input in a variable, and pass the variable as a parameter to the function/routine/subroutine. The function/routine/subroutine may perform calculations using the parameter and return a value that the rest of the application can use to reach a result. The value of the variable or parameter passed to the function/routine/subroutine, and/or return value can be obtained or traced. Values of user or other inputs, variables, parameters, and/or other items of interest can be obtained through previously described tracing, instrumentation, and/or other techniques. Other platforms, tools, and/or techniques may provide equivalent or similar functionalities as the above described ones.

Referring to FIG. **3**, in yet another example, obtaining instruction sets, data, and/or other information may be implemented through tracing, profiling, or sampling of instruction sets or data in processor registers, memory, or other computing system components where instruction sets, data, and/or other information may be stored or utilized. For example, Instruction Register **212** may be part of Processor **11** and it may store the instruction set currently being executed or decoded. In some processors, Program Counter **211** (also referred to as instruction pointer, instruction address register, instruction counter, or part of instruction sequencer) may be incremented after fetching an instruction set, and it may hold or point to the memory address of the next instruction set to be executed. In a processor where the incrementation precedes the fetch, Program Counter **211** may point to the current instruction set being executed. In the instruction cycle, an instruction set may be loaded into Instruction Register **212** after Processor **11** fetches it from location in Memory **12** pointed to by Program Counter **211**. Instruction Register **212** may hold the instruction set while it is decoded by Instruction Decoder **213**, prepared, and executed. In some aspects, data (i.e. operands, etc.) needed for instruction set execution may be loaded from Memory **12** into a register within Register Array **214**. In other aspects, the data may be loaded directly into Arithmetic Logic Unit **215**. For instance, as instruction sets pass through Instruction Register **212** during application execution, they may be transmitted to Acquisition Interface **120** as shown. Examples of the steps in execution of a machine instruction set may include decoding the opcode (i.e. portion of a machine instruction set that may specify the operation to be performed), determining where the operands may be located (depending on architecture, operands may be in registers, the stack, memory, I/O ports, etc.), retrieving the operands, allocating processor resources to execute the instruction set (needed in some types of processors), performing the operation indicated by the instruction set, saving the results of execution, and/or other execution steps. Examples of the

types of machine instruction sets that can be utilized include arithmetic, data handling, logical, program control, as well as special and/or other instruction set types. In addition to the ones described or shown, examples of other computing system or processor components that can be used during an instruction cycle include memory address register (MAR) that may hold the address of a memory block to be read from or written to; memory data register (MDR) that may hold data fetched from memory or data waiting to be stored in memory; data registers that may hold numeric values, characters, small bit arrays, or other data; address registers that may hold addresses used by instruction sets that indirectly access memory; general purpose registers (GPRs) that may store both data and addresses; conditional registers that may hold truth values often used to determine whether some instruction set should or should not be executed; floating point registers (FPRs) that may store floating point numbers; constant registers that may hold read-only values such as zero, one, or pi; special purpose registers (SPRs) such as status register, program counter, or stack pointer that may hold information on program state; machine-specific registers that may store data and settings related to a particular processor; Register Array **214** that may include an array of any number of processor registers; Arithmetic Logic Unit **215** that may perform arithmetic and logic operations; control unit that may direct processor's operation; and/or other circuits or components. Tracing, profiling, or sampling of processor registers, memory, or other computing system components can be implemented in a program, combination of hardware and program, or purely hardware system. Dedicated hardware may be built to perform tracing, profiling, or sampling of processor registers or any computing system components with marginal or no impact to computing overhead.

One of ordinary skill in art will recognize that FIG. **3** depicts one of many implementations of processor or computing system components, and that various additional components can be included, or some of the disclosed ones can be excluded, or a combination thereof can be utilized in alternate implementations. Processor or computing system components may be arranged or connected differently in alternate implementations. Processor or computing system components may also be connected with external elements using various connections. For instance, the connection between Instruction Register **212** and Acquisition Interface **120** may include any number or types of connections such as, for example, a dedicated connection for each bit of Instruction Register **212** (i.e. 32 connections for a 32 bit Instruction Register **212**, etc.). Any of the described or other connections or interfaces may be implemented among any processor or computing system components and Acquisition Interface **120** or other elements.

Referring to FIGS. **4**A-**4**B, in yet another example, obtaining instruction sets, data, and/or other information may be implemented through tracing, profiling, or sampling of Logic Circuit **250**. While Processor **11** includes any type or embodiment of logic circuit, Logic Circuit **250** is described separately here to offer additional detail on its functioning. Some Devices **98** may not need the processing capabilities of an entire Processor **11**, but instead a more tailored Logic Circuit **250**. Examples of such Devices **98** include home appliances, audio or video electronics, vehicle systems, toys, industrial machines, robots, and/or others. Logic Circuit **250** comprises the functionality for performing logic operations. Logic Circuit **250** comprises the functionality for performing logic operations using the circuit's inputs and producing outputs based on the logic operations performed on the inputs. Logic Circuit **250** may generally be implemented using transistors, diodes, and/or other electronic switches, but can also be constructed using vacuum tubes, electromagnetic relays (relay logic), fluidic logic, pneumatic logic, optics, molecules, or even mechanical elements. In some aspects, Logic Circuit **250** may be or include a microcontroller, field-programmable gate array (FPGA), application-specific integrated circuit (ASIC), and/or other computing circuit or device. In other aspects, Logic Circuit **250** may be or include any circuit or device comprising one or more logic gates, one or more transistors, one or more switches, and/or one or more other logic components. In further aspects, Logic Circuit **250** may be or include any integrated or other circuit or device that can perform logic operations. Logic may generally refer to Boolean logic utilized in binary operations, but other logics can also be used. Input into Logic Circuit **250** may include or refer to a value inputted into the Logic Circuit **250**, therefore, these terms may be used interchangeably herein depending on context. In one example, Logic Circuit **250** may perform some logic operations using four input values and produce two output values. As the four input values are delivered to or received by Logic Circuit **250**, they may be obtained by Acquisition Interface **120** through the four hardwired connections as shown in FIG. **4**A. In another example, Logic Circuit **250** may perform some logic operations using four input values and produce two output values. As the two output values are generated by or transmitted out of Logic Circuit **250**, they may be obtained by Acquisition Interface **120** through the two hardwired connections as shown in FIG. **4**B. In a further example, instead of or in addition to obtaining input and/or output values of Logic Circuit **250**, the state of Logic Circuit **250** may be obtained by reading or accessing values from one or more Logic Circuit's **250** internal components such as registers, memories, buses, and/or others (i.e. similar to the previously described tracing, profiling, and/or sampling of Processor **11** components, etc.). Tracing, profiling, or sampling of Logic Circuit **250** can be implemented in a program, combination of hardware and program, or purely hardware system. Dedicated hardware may be built to perform tracing, profiling or sampling of Logic Circuit **250** with marginal or no impact to computing overhead. Any of the elements and/or techniques for tracing, profiling, or sampling of Logic Circuit **250** can similarly be implemented with Processor **11** and/or other processing elements. In some designs, VSADO Unit **100** may include clamps and/or other elements to attach VSADO Unit **100** to inputs (i.e. input wires, etc.) into and/or outputs (i.e. output wires, etc.) from Logic Circuit **250**. Such clamps and/or attachment elements enable seamless attachment of VSADO Unit **100** to any circuit or computing device without the need to redesign or alter the circuit or computing device.

In some embodiments, VSADO Unit **100** may learn input values directly from an actuator (previously described, not shown). For example, Logic Circuit **250** or other processing element may control an actuator that enables Device **98** to perform mechanical, physical, and/or other operations. An actuator may receive one or more input values or control signals from Logic Circuit **250** or other processing element directing the actuator to perform specific operations. As one or more input values or control signals are delivered to or received by the actuator, they may be obtained by Acquisition Interface **120** as previously described with respect to obtaining input values of Logic Circuit **250**. Specifically, for instance, one or more input values or control signals of an

actuator may be obtained by Acquisition Interface **120** via hardwired or other connections.

One of ordinary skill in art will recognize that FIGS. **4**A-**4**B depict one of many implementations of Logic Circuit **250** and that any number of input and/or output values can be utilized in alternate implementations. One of ordinary skill in art will also recognize that Logic Circuit **250** may include any number and/or combination of logic components to implement any logic operations.

Other additional techniques or elements may be utilized as needed for obtaining instruction sets, data, and/or other information, or some of the disclosed techniques or elements may be excluded, or a combination thereof may be utilized in alternate embodiments.

Referring to FIGS. **5**A-**5**C, some embodiments of Instruction Sets **526** are illustrated. In some aspects, Instruction Set **526** includes one or more instructions or commands of Application Program **18**. For example, Instruction Set **526** may include one or more instructions or commands of a high-level programming language such as Java or SQL, a low-level language such as assembly or machine language, an intermediate language or construct such as bytecode, and/or any other language or construct. In other aspects, Instruction Set **526** includes one or more inputs into and/or outputs from Logic Circuit **250**, Processor **11**, Application Program **18**, and/or other processing element. In further aspects, Instruction Set **526** includes one or more values or states of registers and/or other components of Logic Circuit **250**, Processor **11**, and/or other processing element. In general, Instruction Set **526** may include one or more instructions, commands, keywords, symbols (i.e. parentheses, brackets, commas, semicolons, etc.), operators (i.e. =, <, >, etc.), variables, values, objects, data structures, functions (i.e. Function1( ), FIRST( ), MIN( ), SQRT( ), etc.), parameters, states, signals, inputs, outputs, characters, digits, references thereto, and/or other components for performing an operation.

In an embodiment shown in FIG. **5**A, Instruction Set **526** includes code of a high-level programming language (i.e. Java, C++, etc.) comprising the following function call construct: Function1 (Parameter1, Parameter2, Parameter3, . . .). An example of a function call applying the above construct includes the following Instruction Set **526**: moveTo(Object1, 29, 17). The function or reference thereto "moveTo(Object1, 29, 17)" may be an Instruction Set **526** directing Object1 to move to a location with coordinates 29 and 17, for example. In another embodiment shown in FIG. **5**B, Instruction Set **526** includes structured query language (SQL). In a further embodiment shown in FIG. **5**C, Instruction Set **526** includes bytecode (i.e. Java bytecode, Python bytecode, CLR bytecode, etc.). In a further embodiment shown in FIG. **5**D, Instruction Set **526** includes assembly code. In a further embodiment shown in FIG. **5**E, Instruction Set **526** includes machine code.

Referring to FIGS. **6**A-**6**B, some embodiments of Extra Information **527** (also referred to as Extra Info **527**) are illustrated. In an embodiment shown in FIG. **6**A, Digital Picture **525** may include or be associated with Extra Info **527**. In an embodiment shown in FIG. **6**B, Instruction Set **526** may include or be associated with Extra Info **527**.

Extra Info **527** comprises the functionality for storing any information useful in comparisons or decision making performed in autonomous device operation, and/or other functionalities. One or more Extra Infos **527** can be stored in, appended to, or associated with a Digital Picture **525**, Instruction Set **526**, and/or other element. In some embodiments, the system can obtain Extra Info **527** at a time of capturing or receiving of Digital Picture **525**. In other embodiments, the system can obtain Extra Info **527** at a time of acquisition of Instruction Set **526**. In general, the system or any element thereof can obtain Extra Info **527** at any time. Examples of Extra Info **527** include time information, location information, computed information, observed information, sensory information, contextual information, and/or other information. Any information can be utilized that can provide information for enhanced comparisons or decision making performed in autonomous device operation. Which information is utilized and/or stored in Extra Info **527** can be set by a user, by VSADO system administrator, or automatically by the system. Extra Info **527** may include or be referred to as contextual information, and vice versa. Therefore, these terms may be used interchangeably herein depending on context.

In some aspects, time information (i.e. time stamp, etc.) can be utilized and/or stored in Extra Info **527**. Time information can be useful in comparisons or decision making performed in autonomous device operation related to a specific time period as Device **98** may be required to perform specific operations at certain parts of day, month, year, and/or other time periods. Time information can be obtained from the system clock, online clock, oscillator, or other time source. In one example, a thermostat device may be directed to turn heat on in the morning and/or turn heat off during the day. In a further example, a personal computer device may be directed to start or stop an application program or process on a particular day of the month. In general, Extra Info **527** may include time information related to when Device **98** performed an operation. In other aspects, location information (i.e. coordinates, address, etc.) can be utilized and/or stored in Extra Info **527**. Location information can be useful in comparisons or decision making performed in autonomous device operation related to a specific place as Device **98** may be required to perform specific operations at certain places. Location information can be obtained from a positioning system (i.e. radio signal triangulation in smartphones or tablets, GPS capabilities, etc.) if one is available. In one example, a smartphone device may be directed to engage a vibrate mode in a school or house of worship. In another example, a vehicle may be directed to turn right at a particular road crossing. In general, Extra Info **527** may include location information related to where Device **98** performed an operation. In further aspects, computed information can be utilized and/or stored in Extra Info **527**. Computed information can be useful in comparisons or decision making performed in autonomous device operation where information can be calculated, inferred, or derived from other available information. VSADO Unit **100** may include computational functionalities to create Extra Info **527** by performing calculations or inferences using other information. In one example, Device's **98** speed can be computed or estimated from the Device's **98** location and/or time information. In another example, Device's **98** bearing (i.e. angle or direction of movement, etc.) can be computed or estimated from the Device's **98** location information by utilizing Pythagorean theorem, trigonometry, and/or other theorems, formulas, or disciplines. In a further example, speeds, bearings, distances, and/or other properties of objects around Device **98** can similarly be computed or inferred, thereby providing geo-spatial and situational awareness and/or capabilities to the Device **98**. In further aspects, observed information can be utilized and/or stored in Extra Info **527**. Observed information can be useful in comparisons or decision making performed in autonomous device operation related to a specific object or environment

as Device **98** may be required to perform certain operations around specific objects or in specific environments. For example, an object or environment can be recognized by processing one or more Digital Pictures **525** from Picture Capturing Apparatus **90**. Any features, functionalities, and embodiments of Picture Recognizer **350** (later described) can be utilized for such recognizing. In one example, book shelves recognized in the background of one or more Digital Pictures **525** from Picture Capturing Apparatus **90** may indicate a library or book store. In another example, trees recognized in the background of one or more Digital Pictures **525** from Picture Capturing Apparatus **90** may indicate a park. In a further example, a pedestrian recognized in one or more Digital Pictures **525** from Picture Capturing Apparatus **90** may indicate a street. In further aspects, sensory information can be utilized and/or stored in Extra Info **527**. Examples of sensory information include acoustic information, visual information, tactile information, and/or others. Sensory information can be useful in comparisons or decision making performed in autonomous device operation related to a specific object or environment as Device **98** may be required to perform certain operations around specific objects or in specific environments. For example, an object or environment can be recognized by processing digital sound from a sound capturing apparatus (i.e. microphone, etc., not shown). Any features, functionalities, and embodiments of a speech or sound recognizer (not shown) can be utilized for such recognizing. In one example, sound of waves recognized in digital sound from a sound capturing apparatus may indicate a beach. In another example, sound of a horn recognized in digital sound from a sound capturing apparatus may indicate a proximal vehicle. In some designs where acoustic information includes one or more digital sound samples of Device's **98** surrounding captured by a sound capturing apparatus, the digital sound samples can be learned and/or used similar to Digital Pictures **525** of Device's **98** visual surrounding. In such designs, both Digital Pictures **525** and digital sound samples of a device's surrounding can be learned and/or used for autonomous device operation. In further aspects, other information can be utilized and/or stored in Extra Info **527**. Examples of such other information include user specific information (i.e. skill level, age, gender, etc.), group user information (i.e. access level, etc.), version of Application Program **18**, the type of Application Program **18**, the type of Processor **11**, the type of Logic Circuit **250**, the type of Device **98**, and/or other information.

Referring to FIG. **7**, an embodiment where VSADO Unit **100** is part of or operating on Processor **11** is illustrated. In one example, VSADO Unit **100** may be a hardware element or circuit embedded or built into Processor **11**. In another example, VSADO Unit **100** may be a program operating on Processor **11**.

Referring to FIG. **8**, an embodiment where VSADO Unit **100** resides on Server **96** accessible over Network **95** is illustrated. Any number of Devices **98** may connect to such remote VSADO Unit **100** and the remote VSADO Unit **100** may learn their operations in various visual surroundings. In turn, any number of Devices **98** can utilize the remote VSADO Unit **100** for autonomous operation. A remote VSADO Unit **100** can be offered as a network service (i.e. online application, etc.). In some aspects, a remote VSADO Unit **100** (i.e. global VSADO Unit **100**, etc.) may reside on the Internet and be available to all the world's Devices **98** configured to transmit their operations in various visual surroundings and/or configured to utilize the remote VSADO Unit **100** for autonomous operation. Server **96** may be or include any type or form of a remote computing device such as an application server, a network service server, a cloud server, a cloud, and/or other remote computing device. Server **96** may include any features, functionalities, and embodiments of the previously described Computing Device **70**. It should be understood that Server **96** does not have to be a separate computing device and that Server **96**, its elements, or its functionalities can be implemented on Device **98**. Network **95** may include various networks, connection types, protocols, interfaces, APIs, and/or other elements or techniques known in art all of which are within the scope of this disclosure. Any of the previously described networks, network or connection types, networking interfaces, and/or other networking elements or techniques can similarly be utilized. Any of the disclosed elements may reside on Server **96** in alternate implementations. In one example, Artificial Intelligence Unit **110** can reside on Server **96** and Acquisition Interface **120** and/or Modification Interface **130** can reside on Device **98**. In another example, Knowledgebase **530** can reside on Server **96** and the rest of the elements of VSADO Unit **100** can reside on Device **98**. Any other combination of local and remote elements can be implemented.

Referring to FIG. **9**, an embodiment where Picture Capturing Apparatus **90** is part of Remote Device **97** accessible over Network **95** is illustrated. In such embodiments, VSADO Unit **100** may learn Device's **98** operation based on another device's visual surrounding. Such embodiments can be utilized, for instance, in any situation where one device controls (i.e. remote control, etc.) another device, any situation where some or all of the processing is on one device and picture capturing capabilities are on another device, and/or other situations. In one example, a drone controlling device (i.e. Device **98**) may receive its visual input from a camera on the drone (i.e. Remote Device **97**). In another example, a toy controlling device (i.e. Device **98**) may receive its visual input from a camera on the toy (i.e. Remote Device **97**). In a further example, a people or crowd analyzing computing device (i.e. Device **98**) may receive its visual input from a camera of a monitoring device (i.e. Remote Device **97**). Any of the disclosed elements in addition to Picture Capturing Apparatus **90** may reside on Remote Device **97** in alternate implementations as previously described with respect to Server **96**.

Referring to FIG. **10**, an embodiment of VSADO Unit **100** comprising Picture Recognizer **350** is illustrated. VSADO Unit **100** can utilize Picture Recognizer **350** to detect or recognize persons, objects, and/or their activities in one or more digital pictures from Picture Capturing Apparatus **90**. In general, VSADO Unit **100** and/or other disclosed elements can use Picture Recognizer **350** for any operation supported by Picture Recognizer **350**. Picture Recognizer **350** comprises the functionality for detecting or recognizing persons or objects in visual data. Picture Recognizer **350** comprises the functionality for detecting or recognizing activities in visual data. Picture Recognizer **350** comprises the functionality for tracking persons, objects, and/or their activities in visual data. Picture Recognizer **350** comprises other disclosed functionalities. Visual data includes digital motion pictures, digital still pictures (i.e. bitmaps, etc.), and/or other visual data. Examples of file formats that can be utilized to store visual data include AVI, DivX, MPEG, JPEG, GIF, TIFF, PNG, PDF, and/or other file formats. Picture Recognizer **350** may detect or recognize a person and/or his/her activities as well as track the person and/or his/her activities in one or more digital pictures or streams of digital pictures (i.e. motion pictures, video, etc.). Picture

Recognizer **350** may detect or recognize a human head or face, upper body, full body, or portions/combinations thereof. In some aspects, Picture Recognizer **350** may detect or recognize persons, objects, and/or their activities from a digital picture by comparing regions of pixels from the digital picture with collections of pixels comprising known persons, objects, and/or their activities. The collections of pixels comprising known persons, objects, and/or their activities can be learned or manually, programmatically, or otherwise defined. The collections of pixels comprising known persons, objects, and/or their activities can be stored in any data structure or repository (i.e. one or more files, database, etc.) that resides locally on Device **98**, or remotely on a remote computing device (i.e. server, cloud, etc.) accessible over a network. In other aspects, Picture Recognizer **350** may detect or recognize persons, objects, and/or their activities from a digital picture by comparing features (i.e. lines, edges, ridges, corners, blobs, regions, etc.) of the digital picture with features of known persons, objects, and/or their activities. The features of known persons, objects, and/or their activities can be learned or manually, programmatically, or otherwise defined. The features of known persons, objects, and/or their activities can be stored in any data structure or repository (i.e. neural network, one or more files, database, etc.) that resides locally on Device **98**, or remotely on a remote computing device (i.e. server, cloud, etc.) accessible over a network. Typical steps or elements in a feature oriented picture recognition include pre-processing, feature extraction, detection/segmentation, decision-making, and/or others, or a combination thereof, each of which may include its own sub-steps or sub-elements depending on the application. In further aspects, Picture Recognizer **350** may detect or recognize multiple persons, objects, and/or their activities from a digital picture using the aforementioned pixel or feature comparisons, and/or other detection or recognition techniques. For example, a picture may depict two persons in two of its regions both of whom Picture Recognizer **350** can detect simultaneously. In further aspects, where persons, objects, and/or their activities span multiple pictures, Picture Recognizer **350** may detect or recognize persons, objects, and/or their activities by applying the aforementioned pixel or feature comparisons and/or other detection or recognition techniques over a stream of digital pictures (i.e. motion picture, video, etc.). For example, once a person is detected in a digital picture (i.e. frame, etc.) of a stream of digital pictures (i.e. motion picture, video, etc.), the region of pixels comprising the detected person or the person's features can be searched in other pictures of the stream of digital pictures, thereby tracking the person through the stream of digital pictures. In further aspects, Picture Recognizer **350** may detect or recognize a person's activities by identifying and/or analyzing differences between a detected region of pixels of one picture (i.e. frame, etc.) and detected regions of pixels of other pictures in a stream of digital pictures. For example, a region of pixels comprising a person's face can be detected in multiple consecutive pictures of a stream of digital pictures (i.e. motion picture, video, etc.). Differences among the detected regions of the consecutive pictures may be identified in the mouth part of the person's face to indicate smiling or speaking activity. Any technique for recognizing speech from mouth/lip movements can be used in this and other examples. In further aspects, Picture Recognizer **350** may detect or recognize persons, objects, and/or their activities using one or more artificial neural networks, which may include statistical techniques. Examples of artificial neural networks that can be used in Picture Recognizer **350** include convolutional neural networks (CNNs), time delay neural networks (TDNNs), deep neural networks, and/or others. In one example, picture recognition techniques and/or tools involving convolutional neural networks may include identifying and/or analyzing tiled and/or overlapping regions or features of a digital picture, which may then be used to search for pictures with matching regions or features. In another example, features of different convolutional neural networks responsible for spatial and temporal streams can be fused to detect persons, objects, and/or their activities in streams of digital pictures (i.e. motion pictures, videos, etc.). In general, Picture Recognizer **350** may include any machine learning, deep learning, and/or other artificial intelligence techniques. Any other techniques known in art can be utilized in Picture Recognizer **350**. For example, thresholds for similarity, statistical, and/or optimization techniques can be utilized to determine a match in any of the above-described detection or recognition techniques. Picture Recognizer **350** comprises any features, functionalities, and embodiments of Similarity Comparison **125** (later described).

In some exemplary embodiments, object recognition techniques and/or tools such as OpenCV (Open Source Computer Vision) library, CamFind API, Kooaba, 6px API, Dextro API, and/or others can be utilized for detecting or recognizing objects (i.e. objects, animals, people, etc.) in digital pictures. In some aspects, object recognition techniques and/or tools involve identifying and/or analyzing object features such as lines, edges, ridges, corners, blobs, regions, and/or their relative positions, sizes, shapes, etc., which may then be used to search for pictures with matching features. For example, OpenCV library can detect an object (i.e. car, pedestrian, door, building, animal, person, etc.) in one or more digital pictures captured by Picture Capturing Apparatus **90** or stored in an electronic repository, which can then be utilized in VSADO Unit **100**, Artificial Intelligence Unit **110**, and/or other elements.

In other exemplary embodiments, facial recognition techniques and/or tools such as OpenCV (Open Source Computer Vision) library, Animetrics FaceR API, Lambda Labs Facial Recognition API, Face++ SDK, Neven Vision (also known as N-Vision) Engine, and/or others can be utilized for detecting or recognizing faces in digital pictures. In some aspects, facial recognition techniques and/or tools involve identifying and/or analyzing facial features such as the relative position, size, and/or shape of the eyes, nose, cheekbones, jaw, etc., which may then be used to search for pictures with matching features. For example, FaceR API can detect a person's face in one or more digital pictures captured by Picture Capturing Apparatus **90** or stored in an electronic repository, which can then be utilized in VSADO Unit **100**, Artificial Intelligence Unit **110**, and/or other elements.

Referring to FIG. **11**, an embodiment of Artificial Intelligence Unit **110** is illustrated. Artificial Intelligence Unit **110** comprises interconnected Knowledge Structuring Unit **520**, Knowledgebase **530**, Decision-making Unit **540**, and Confirmation Unit **550**. Other additional elements can be included as needed, or some of the disclosed ones can be excluded, or a combination thereof can be utilized in alternate embodiments.

Artificial Intelligence Unit **110** comprises the functionality for learning Device's **98** operation in various visual surroundings. Artificial Intelligence Unit **110** comprises the functionality for learning one or more digital pictures correlated with any instruction sets, data, and/or other information. In some aspects, Artificial Intelligence Unit **110**

comprises the functionality for learning one or more Digital Pictures **525** of Device's **98** surrounding correlated with any Instruction Sets **526** and/or Extra Info **527**. In other aspects, Artificial Intelligence Unit **110** comprises the functionality for learning one or more Digital Pictures **525** of Device's **98** surrounding some of which may not be correlated with any Instruction Sets **526** and/or Extra Info **527**. Further, Artificial Intelligence Unit **110** comprises the functionality for anticipating Device's **98** operation in various visual surroundings. Artificial Intelligence Unit **110** comprises the functionality for anticipating one or more instruction sets, data, and/or other information. Artificial Intelligence Unit **110** comprises the functionality for anticipating one or more Instruction Sets **526** based on one or more incoming Digital Pictures **525** of Device's **98** surrounding. Artificial Intelligence Unit **110** comprises the functionality for anticipating one or more Instruction Sets **526** to be used or executed in Device's **98** autonomous operation. Artificial Intelligence Unit **110** also comprises other disclosed functionalities.

Knowledge Structuring Unit **520**, Knowledgebase **530**, and Decision-making Unit **540** are described later.

Confirmation Unit **550** comprises the functionality for confirming, modifying, evaluating (i.e. rating, etc.), and/or canceling one or more anticipatory Instruction Sets **526**, and/or other functionalities. Confirmation Unit **550** is an optional element that can be omitted depending on implementation. In some embodiments, Confirmation Unit **550** can serve as a means of confirming anticipatory Instruction Sets **526**. For example, Decision-making Unit **540** may determine one or more anticipatory Instruction Sets **526** and provide them to User **50** for confirmation. User **50** may be provided with an interface (i.e. graphical user interface, selectable list of anticipatory Instruction Sets **526**, etc.) to approve or confirm execution of the anticipatory Instruction Sets **526**. In some aspects, Confirmation Unit **550** can automate User **50** confirmation. In one example, if one or more incoming Digital Pictures **525** from Picture Capturing Apparatus **90** and one or more Digital Pictures **525** from a Knowledge Cell **800** were found to be a perfect or highly similar match, anticipatory Instruction Sets **526** correlated with the one or more Digital Pictures **525** from the Knowledge Cell **800** can be automatically executed without User's **50** confirmation. Conversely, if one or more incoming Digital Pictures **525** from Picture Capturing Apparatus **90** and one or more Digital Pictures **525** from a Knowledge Cell **800** were found to be less than a highly similar match, anticipatory Instruction Sets **526** correlated with the one or more Digital Pictures **525** from the Knowledge Cell **800** can be presented to User **50** for confirmation and/or modifying. A threshold that defines a highly or otherwise similar match can be utilized in such implementations. Such threshold can be defined by a user, by VSADO system administrator, or automatically by the system based on experience, testing, inquiry, analysis, synthesis, or other techniques, knowledge, or input. In other embodiments, Confirmation Unit **550** can serve as a means of modifying or editing anticipatory Instruction Sets **526**. For example, Decision-making Unit **540** may determine one or more anticipatory Instruction Sets **526** and provide them to User **50** for modification. User **50** may be provided with an interface (i.e. graphical user interface, etc.) to modify the anticipatory Instruction Sets **526** before their execution. In further embodiments, Confirmation Unit **550** can serve as a means of evaluating or rating anticipatory Instruction Sets **526** if they matched User's **50** intended operation. For example, Decision-making Unit **540** may determine one or more anticipatory Instruction Sets **526**, which the system may automatically execute. User **50** may be provided with an interface (i.e. graphical user interface, etc.) to rate (i.e. on a scale from 0 to 1, etc.) how well Decision-making Unit **540** predicted the executed anticipatory Instruction Sets **526**. In some aspects, rating can be automatic and based on a particular function or method that rates how well the anticipatory Instruction Sets **526** matched the desired operation. In one example, a rating function or method can assign a higher rating to anticipatory Instruction Sets **526** that were least modified in the confirmation process. In another example, a rating function or method can assign a higher rating to anticipatory Instruction Sets **526** that were canceled least number of times by User **50**. Any other automatic rating function or method can be utilized. In yet other embodiments, Confirmation Unit **550** can serve as a means of canceling anticipatory Instruction Sets **526** if they did not match User's **50** intended operation. For example, Decision-making Unit **540** may determine one or more anticipatory Instruction Sets **526**, which the system may automatically execute. The system may save the state of Device **98**, Processor **11** (save its register values, etc.), Logic Circuit **250**, Application Program **18** (i.e. save its variables, data structures, objects, location of its current instruction, etc.), and/or other processing elements before executing anticipatory Instruction Sets **526**. User **50** may be provided with an interface (i.e. graphical user interface, selectable list of prior executed anticipatory Instruction Sets **526**, etc.) to cancel one or more of the prior executed anticipatory Instruction Sets **526**, and restore Device **98**, Processor **11**, Logic Circuit **250**, Application Program **18**, and/or other processing elements to a prior state. In some aspects, Confirmation Unit **550** can optionally be disabled or omitted in order to provide an uninterrupted operation of Device **98**, Processor **11**, Logic Circuit **250**, and/or Application Program **18**. For example, a microwave oven may be suitable for implementing the user confirmation step, whereas, a robot or vehicle may be less suitable for implementing such interrupting step due to the real time nature of robot or vehicle operation.

Referring to FIG. **12**, an embodiment of Knowledge Structuring Unit **520** correlating individual Digital Pictures **525** with any Instruction Sets **526** and/or Extra Info **527** is illustrated. Knowledge Structuring Unit **520** comprises the functionality for structuring the knowledge of a device's operation in various visual surroundings, and/or other functionalities. Knowledge Structuring Unit **520** comprises the functionality for correlating one or more Digital Pictures **525** of Device's **98** surrounding with any Instruction Sets **526** and/or Extra Info **527**. Knowledge Structuring Unit **520** comprises the functionality for creating or generating Knowledge Cell **800** and storing one or more Digital Pictures **525** correlated with any Instruction Sets **526** and/or Extra Info **527** into the Knowledge Cell **800**. As such, Knowledge Cell **800** comprises the functionality for storing one or more Digital Pictures **525** correlated with any Instruction Sets **526** and/or Extra Info **527**. Knowledge Cell **800** includes a unit of knowledge of how Device **98** operated in a visual surrounding. Once created or generated, Knowledge Cells **800** can be used in/as neurons, nodes, vertices, or other elements in any of the data structures or arrangements (i.e. neural networks, graphs, sequences, etc.) used for storing the knowledge of Device's **98** operation in various visual surroundings, thereby facilitating learning functionalities herein. It should be noted that Extra Info **527** may be optionally used in some implementations to enable enhanced comparisons or decision making in autonomous device operation where applicable, and that Extra Info **527** can be omitted in alternate implementations.

In some embodiments, Knowledge Structuring Unit **520** receives one or more Digital Pictures **525** from Picture Capturing Apparatus **90**. Knowledge Structuring Unit **520** may also receive one or more Instruction Sets **526** from Acquisition Interface **120**. Knowledge Structuring Unit **520** may further receive any Extra Info **527**. Although, Extra Info **527** is not shown in this and/or other figures for clarity of illustration, it should be noted that any Digital Picture **525**, Instruction Set **526**, and/or other element may include or be associated with Extra Info **527**. Knowledge Structuring Unit **520** may correlate one or more Digital Pictures **525** with any Instruction Sets **526** and/or Extra Info **527**. Knowledge Structuring Unit **520** may then create Knowledge Cell **800** and store the one or more Digital Pictures **525** correlated with Instruction Sets **526** and/or Extra Info **527** into the Knowledge Cell **800**. Knowledge Cell **800** may include any data structure or arrangement that can facilitate such storing. For example, Knowledge Structuring Unit **520** may create Knowledge Cell **800***ax* and structure within it Digital Picture **525***a***1** correlated with Instruction Sets **526***a***1-526***a***3** and/or any Extra Info **527** (not shown). Knowledge Structuring Unit **520** may further structure within Knowledge Cell **800***ax* a Digital Picture **525***a***2** correlated with Instruction Set **526***a***4** and/or any Extra Info **527** (not shown). Knowledge Structuring Unit **520** may further structure within Knowledge Cell **800***ax* a Digital Picture **525***a***3** without a correlated Instruction Set **526** and/or Extra Info **527**. Knowledge Structuring Unit **520** may further structure within Knowledge Cell **800***ax* a Digital Picture **525***a***4** correlated with Instruction Sets **526***a***5-526***a***6** and/or any Extra Info **527** (not shown). Knowledge Structuring Unit **520** may further structure within Knowledge Cell **800***ax* a Digital Picture **525***a***5** without a correlated Instruction Set **526** and/or Extra Info **527**. Knowledge Structuring Unit **520** may structure within Knowledge Cell **800***ax* additional Digital Pictures **525** correlated with any number (including zero [i.e. uncorrelated]) of Instruction Sets **526** and/or Extra Info **527** by following the same logic as described above.

In some embodiments, Knowledge Structuring Unit **520** may correlate a Digital Picture **525** with one or more temporally corresponding Instruction Sets **526** and/or Extra Info **527**. This way, Knowledge Structuring Unit **520** can structure the knowledge of Device's **98** operation at or around the time of the capturing of Digital Pictures **525** of Device's **98** surrounding. Such functionality enables spontaneous or seamless learning of Device's **98** operation in various visual surroundings as user operates the device in real life situations. In some designs, Knowledge Structuring Unit **520** may receive a stream of Instruction Sets **526** used or executed to effect Device's **98** operations as well as a stream of Digital Pictures **525** of Device's **98** surrounding as the operations are performed. Knowledge Structuring Unit **520** can then correlate Digital Pictures **525** from the stream of Digital Pictures **525** with temporally corresponding Instruction Sets **526** from the stream of Instruction Sets **526** and/or any Extra Info **527**. Digital Pictures **525** without a temporally corresponding Instruction Set **526** may be uncorrelated, for instance. In some aspects, Instruction Sets **526** and/or Extra Info **527** that temporally correspond to a Digital Picture **525** may include Instruction Sets **526** used and/or Extra Info **527** obtained at the time of capturing the Digital Picture **525**. In other aspects, Instruction Sets **526** and/or Extra Info **527** that temporally correspond to a Digital Picture **525** may include Instruction Sets **526** used and/or Extra Info **527** obtained within a certain time period before and/or after capturing the Digital Picture **525**. For example, Instruction Sets **526** and/or Extra Info **527** that temporally correspond to a Digital Picture **525** may include Instruction Sets **526** used and/or Extra Info **527** obtained within 50 milliseconds, 1 second, 3 seconds, 20 seconds, 1 minute, 41 minutes, 2 hours, or any other time period before and/or after capturing the Digital Picture **525**. Such time periods can be defined by a user, by VSADO system administrator, or automatically by the system based on experience, testing, inquiry, analysis, synthesis, or other techniques, knowledge, or input. In other aspects, Instruction Sets **526** and/or Extra Info **527** that temporally correspond to a Digital Picture **525** may include Instruction Sets **526** used and/or Extra Info **527** obtained from the time of capturing of the Digital Picture **525** to the time of capturing of a next Digital Picture **525**. In further aspects, Instruction Sets **526** and/or Extra Info **527** that temporally correspond to a Digital Picture **525** may include Instruction Sets **526** used and/or Extra Info **527** obtained from the time of capturing of a previous Digital Picture **525** to the time of capturing of the Digital Picture **525**. Any other temporal relationship or correspondence between Digital Pictures **525** and correlated Instruction Sets **526** and/or Extra Info **527** can be implemented.

In some embodiments, Knowledge Structuring Unit **520** can structure the knowledge of Device's **98** operation in a visual surrounding into any number of Knowledge Cells **800**. In some aspects, Knowledge Structuring Unit **520** can structure into a Knowledge Cell **800** a single Digital Picture **525** correlated with any Instruction Sets **526** and/or Extra Info **527**. In other aspects, Knowledge Structuring Unit **520** can structure into a Knowledge Cell **800** any number (i.e. 2, 3, 5, 8, 19, 33, 99, 1715, 21822, 393477, 6122805, etc.) of Digital Pictures **525** correlated with any Instruction Sets **526** and/or Extra Info **527**. In a special case, Knowledge Structuring Unit **520** can structure all Digital Pictures **525** correlated with any Instruction Sets **526** and/or Extra Info **527** into a single long Knowledge Cell **800**. In further aspects, Knowledge Structuring Unit **520** can structure Digital Pictures **525** correlated with any Instruction Sets **526** and/or Extra Info **527** into a plurality of Knowledge Cells **800**. In a special case, Knowledge Structuring Unit **520** can store periodic streams of Digital Pictures **525** correlated with any Instruction Sets **526** and/or Extra Info **527** into a plurality of Knowledge Cells **800** such as hourly, daily, weekly, monthly, yearly, or other periodic Knowledge Cells **800**.

In some embodiments, Knowledge Structuring Unit **520** may be responsive to a triggering object, action, event, time, and/or other stimulus. In some aspects, the system can detect or recognize an object in Device's **98** visual surrounding, and Knowledge Structuring Unit **520** can structure into a Knowledge Cell **800** one or more Digital Pictures **525** correlated with any Instruction Sets **526** and/or Extra Info **527** related to the object. For example, Knowledge Structuring Unit **520** can structure into a Knowledge Cell **800** one or more Digital Pictures **525** of a pizza from a microwave oven (i.e. Device **98**, etc.) correlated with any Instruction Sets **526** (i.e. inputs, outputs, or states of the microwave oven's microcontroller, etc.) causing the microwave oven to bake the pizza. Knowledge Structuring Unit **520** can also structure into the Knowledge Cell **800** any Extra Info **527** (i.e. time, location, computed, observed, sensory, and/or other information, etc.). In other aspects, the system can detect or recognize a specific action or operation performed by Device **98**, and Knowledge Structuring Unit **520** can structure into a Knowledge Cell **800** one or more Digital Pictures **525** correlated with any Instruction Sets **526** and/or Extra Info **527** related to the action or operation. For example, Knowledge Structuring Unit **520** can structure into a Knowledge Cell **800** one or more Digital Pictures **525**

depicting screwing of a screw by a robotic arm (i.e. Device **98**, etc.) correlated with any Instruction Sets **526** causing the robotic arm to screw the screw. Knowledge Structuring Unit **520** can also structure into the Knowledge Cell **800** any Extra Info **527** (i.e. time, location, computed, observed, sensory, and/or other information, etc.). In further aspects, the system can detect a person in Device's **98** visual surrounding, and Knowledge Structuring Unit **520** can structure into a Knowledge Cell **800** one or more Digital Pictures **525** correlated with any Instruction Sets **526** and/or Extra Info **527** related to the person. For example, Knowledge Structuring Unit **520** can structure into a Knowledge Cell **800** one or more Digital Pictures **525** of a pedestrian in front of a vehicle (i.e. Device **98**, etc.) correlated with any Instruction Sets **526** causing the vehicle to stop. Knowledge Structuring Unit **520** can also structure into the Knowledge Cell **800** any Extra Info **527** (i.e. time, location, computed, observed, sensory, and/or other information, etc.). In further aspects, the system can detect or recognize a significant change in Device's **98** visual surrounding, and Knowledge Structuring Unit **520** can structure into a Knowledge Cell **800** one or more Digital Pictures **525** correlated with any Instruction Sets **526** and/or Extra Info **527** related to the change in visual surrounding. For example, the system can detect a vehicle's (i.e. Device **98**, etc.) changing direction (i.e. turning left, right, etc.) and Knowledge Structuring Unit **520** can structure into a Knowledge Cell **800** one or more Digital Pictures **525** correlated with any Instruction Sets **526** causing the change of direction. Knowledge Structuring Unit **520** can also structure into the Knowledge Cell **800** any Extra Info **527** (i.e. time, location, computed, observed, sensory, and/or other information, etc.). A vehicle's changing direction may be detected as a significant change in the vehicle's visual surrounding as the view of the vehicle's scenery changes significantly. Any features, functionalities, and embodiments of Picture Recognizer **350** can be utilized in the aforementioned detecting or recognizing. In general, Knowledge Structuring Unit **520** can structure into a Knowledge Cell **800** any Digital Pictures **525** correlated with any Instruction Sets **526** and/or Extra Info **527** related to any triggering object, action, event, time, and/or other stimulus.

In some embodiments, Device **98** may include a plurality of Picture Capturing Apparatuses **90**. In one example, different Picture Capturing Apparatuses **90** may capture Digital Pictures **525** of different angles or sides of Device **98**. In another example, different Picture Capturing Apparatuses **90** may be placed on different sub-devices, sub-systems, or elements of Device **98**. Using multiple Picture Capturing Apparatuses **90** may provide additional visual detail in learning and/or using Device's **98** surrounding for autonomous Device **98** operation. In some designs where multiple Picture Capturing Apparatuses **90** are utilized, multiple VSADO Units **100** can also be utilized (i.e. one VSADO Unit **100** for each Picture Capturing Apparatus **90**, etc.). Digital Pictures **525** of Device's **98** surrounding can be correlated with any Instruction Sets **526** and/or Extra Info **527** as previously described. In other designs where multiple Picture Capturing Apparatuses **90** are utilized, collective Digital Pictures **525** of Device's **98** surrounding from multiple Picture Capturing Apparatuses **90** can be correlated with any Instruction Sets **526** and/or Extra Info **527**.

In some embodiments, Device **98** may include a plurality of Logic Circuits **250**, Processors **11**, Application Programs **18**, and/or other processing elements. For example, each processing element may control a sub-device, sub-system, or an element of Device **98**. Using multiple processing elements may provide enhanced control over Device's **98** operation. In some designs where multiple processing elements are utilized, multiple VSADO Units **100** can also be utilized (i.e. one VSADO Unit **100** for each processing element, etc.). Digital Pictures **525** of Device's **98** surrounding can be correlated with any Instruction Sets **526** and/or Extra Info **527** as previously described. In other designs where multiple processing elements are utilized, Digital Pictures **525** of Device's **98** surrounding can be correlated with any collective Instruction Sets **526** and/or Extra Info **527** used or executed by a plurality of processing elements.

Any combination of the aforementioned multiple Picture Capturing Apparatuses **90**, multiple processing elements, and/or other elements can be implemented in alternate embodiments.

Referring to FIG. **13**, another embodiment of Knowledge Structuring Unit **520** correlating individual Digital Pictures **525** with any Instruction Sets **526** and/or Extra Info **527** is illustrated. In such embodiments, Knowledge Structuring Unit **520** may generate Knowledge Cells **800** each comprising a single Digital Picture **525** correlated with any Instruction Sets **526** and/or Extra Info **527**.

Referring to FIG. **14**, an embodiment of Knowledge Structuring Unit **520** correlating streams of Digital Pictures **525** with any Instruction Sets **526** and/or Extra Info **527** is illustrated. In some aspects, a stream of Digital Pictures **525** may include a collection, a group, a sequence, or other plurality of Digital Pictures **525**. In other aspects, a stream of Digital Pictures **525** may include one or more Digital Pictures **525**. In further aspects, a stream of Digital Pictures **525** may include a digital motion picture (i.e. digital video, etc.) or portion thereof. For example, Knowledge Structuring Unit **520** may create Knowledge Cell **800***ax* and structure within it a stream of Digital Pictures **525***a***1-525***an* correlated with Instruction Set **526***a***1** and/or any Extra Info **527** (not shown). Knowledge Structuring Unit **520** may further structure within Knowledge Cell **800***ax* a stream of Digital Pictures **525***b***1-525***bn* correlated with Instruction Sets **526***a***2-526***a***4** and/or and Extra Info **527** (not shown). Knowledge Structuring Unit **520** may further structure within Knowledge Cell **800***ax* a stream of Digital Pictures **525***c***1-525***cn* without correlated Instruction Sets **526** and/or Extra Info **527**. Knowledge Structuring Unit **520** may further structure within Knowledge Cell **800***ax* a stream of Digital Pictures **525***d***1-525***dn* correlated with Instruction Sets **526***a***5-526***a***6** and/or any Extra Info **527** (not shown). Knowledge Structuring Unit **520** may further structure within Knowledge Cell **800***ax* additional streams of Digital Pictures **525** correlated with any number (including zero [i.e. uncorrelated]) of Instruction Sets **526** and/or Extra Info **527** by following the same logic as described above. The number of Digital Pictures **525** in some or all streams of Digital Pictures **525***a***1-525***an*, **525***b***1-525***bn*, etc. may be equal or different. It should be noted that n or other such letters or indicia may follow the sequence and/or context where they are indicated. Also, a same letter or indicia such as n may represent a different number in different elements of a drawing.

Referring to FIG. **15**, another embodiment of Knowledge Structuring Unit **520** correlating streams of Digital Pictures **525** with any Instruction Sets **526** and/or Extra Info **527** is illustrated. In such embodiments, Knowledge Structuring Unit **520** may generate Knowledge Cells **800** each comprising a single stream of Digital Pictures **525** correlated with any Instruction Sets **526** and/or Extra Info **527**.

Knowledgebase **530** comprises the functionality for storing the knowledge of a device's operation in various visual surroundings, and/or other functionalities. Knowledgebase

530 comprises the functionality for storing one or more Digital Pictures 525 of Device's 98 surrounding correlated with any Instruction Sets 526 and/or Extra Info 527. Knowledgebase 530 comprises the functionality for storing one or more Knowledge Cells 800 each including one or more Digital Pictures 525 of Device's 98 surrounding correlated with any Instruction Sets 526 and/or Extra Info 527. In some aspects, Digital Pictures 525 correlated with Instruction Sets 526 and/or Extra Info 527 can be stored directly within Knowledgebase 530 without using Knowledge Cells 800 as the intermediary data structures. In some embodiments, Knowledgebase 530 may be or include Neural Network 530*a* (later described). In other embodiments, Knowledgebase 530 may be or include Graph 530*b* (later described). In further embodiments, Knowledgebase 530 may be or include Collection of Sequences 530*c* (later described). In further embodiments, Knowledgebase 530 may be or include Sequence 533 (later described). In further embodiments, Knowledgebase 530 may be or include Collection of Knowledge Cells 530*d* (later described). In general, Knowledgebase 530 may be or include any data structure or arrangement capable of storing the knowledge of a device's operation in various visual surroundings. Knowledgebase 530 may reside locally on Device 98, or remotely (i.e. remote Knowledgebase 530, etc.) on a remote computing device (i.e. server, cloud, etc.) accessible over a network.

Knowledgebase 530 from one Device 98 or VSADO Unit 100 can be transferred to one or more other Devices 98 or VSADO Units 100. Therefore, the knowledge of Device's 98 operation in various visual surroundings learned on one Device 98 or VSADO Unit 100 can be transferred to one or more other Devices 98 or VSADO Units 100. In one example, Knowledgebase 530 can be copied or downloaded to a file or other repository from one Device 98 or VSADO Unit 100 and loaded or inserted into another Device 98 or VSADO Unit 100. In another example, Knowledgebase 530 from one Device 98 or VSADO Unit 100 can be available on a server accessible by other Devices 98 or VSADO Units 100 over a network. Once loaded into or accessed by a receiving Device 98 or VSADO Unit 100, the receiving Device 98 or VSADO Unit 100 can then implement the knowledge of Device's 98 operation in various visual surroundings learned on the originating Device 98 or VSADO Unit 100. This functionality enables User 50 such as a professional Device 98 operator to record his/her knowledge, methodology, or style of operating Device 98 in various visual surroundings and/or sell his/her knowledge to other users.

Referring to FIG. 16, the disclosed artificially intelligent systems, devices, and methods for learning and/or using visual surrounding for autonomous device operation may include various artificial intelligence models and/or techniques. The disclosed systems, devices, and methods are independent of the artificial intelligence model and/or technique used and any model and/or technique can be utilized to facilitate the functionalities described herein. Examples of these models and/or techniques include deep learning, supervised learning, unsupervised learning, neural networks (i.e. convolutional neural network, recurrent neural network, deep neural network, etc.), search-based, logic and/or fuzzy logic-based, optimization-based, tree/graph/other data structure-based, hierarchical, symbolic and/or sub-symbolic, evolutionary, genetic, multi-agent, deterministic, probabilistic, statistical, and/or other models and/or techniques.

In one example shown in Model A, the disclosed artificially intelligent systems, devices, and methods for learning and/or using visual surrounding for autonomous device operation may include a neural network (also referred to as artificial neural network, etc.). As such, machine learning, knowledge structuring or representation, decision making, pattern recognition, and/or other artificial intelligence functionalities may include a network of Nodes 852 (also referred to as neurons, etc.) and Connections 853 similar to that of a brain. Node 852 can store any data, object, data structure, and/or other item, or reference thereto. Node 852 may also include a function for transforming or manipulating any data, object, data structure, and/or other item. Examples of such transformation functions include mathematical functions (i.e. addition, subtraction, multiplication, division, sin, cos, log, derivative, integral, etc.), object manipulation functions (i.e. creating an object, modifying an object, deleting an object, appending objects, etc.), data structure manipulation functions (i.e. creating a data structure, modifying a data structure, deleting a data structure, creating a data field, modifying a data field, deleting a data field, etc.), and/or other transformation functions. Connection 853 may include or be associated with a value such as a symbolic label or numeric attribute (i.e. weight, cost, capacity, length, etc.). A computational model can be utilized to compute values from inputs based on a pre-programmed or learned function or method. For example, a neural network may include one or more input neurons that can be activated by inputs. Activations of these neurons can then be passed on, weighted, and transformed by a function to other neurons. Neural networks may range from those with only one layer of single direction logic to multi-layer of multi-directional feedback loops. A neural network can use weights to change the parameters of the network's throughput. A neural network can learn by input from its environment or from self-teaching using written-in rules. A neural network can be utilized as a predictive modeling approach in machine learning. An exemplary embodiment of a neural network (i.e. Neural Network 530*a*, etc.) is described later.

In another example shown in Model B, the disclosed artificially intelligent systems, devices, and methods for learning and/or using visual surrounding for autonomous device operation may include a graph or graph-like data structure. As such, machine learning, knowledge structuring or representation, decision making, pattern recognition, and/or other artificial intelligence functionalities may include Nodes 852 (also referred to as vertices or points, etc.) and Connections 853 (also referred to as edges, arrows, lines, arcs, etc.) organized as a graph. In general, any Node 852 in a graph can be connected to any other Node 852. A Connection 853 may include unordered pair of Nodes 852 in an undirected graph or ordered pair of Nodes 852 in a directed graph. Nodes 852 can be part of the graph structure or external entities represented by indices or references. A graph can be utilized as a predictive modeling approach in machine learning. Nodes 852, Connections 853, and/or other elements or operations of a graph may include any features, functionalities, and embodiments of the aforementioned Nodes 852, Connections 853, and/or other elements or operations of a neural network, and vice versa. An exemplary embodiment of a graph (i.e. Graph 530*b*, etc.) is described later.

In a further example shown in Model C, the disclosed artificially intelligent systems, devices, and methods for learning and/or using visual surrounding for autonomous device operation may include a tree or tree-like data structure. As such, machine learning, knowledge structuring or representation, decision making, pattern recognition, and/or other artificial intelligence functionalities may include Nodes 852 and Connections 853 (also referred to as refer-

ences, edges, etc.) organized as a tree. In general, a Node **852** in a tree can be connected to any number (i.e. including zero, etc.) of children Nodes **852**. A tree can be utilized as a predictive modeling approach in machine learning. Nodes **852**, Connections **853**, and/or other elements or operations of a tree may include any features, functionalities, and embodiments of the aforementioned Nodes **852**, Connections **853**, and/or other elements or operations of a neural network and/or graph, and vice versa.

In a further example shown in Model D, the disclosed artificially intelligent systems, devices, and methods for learning and/or using visual surrounding for autonomous device operation may include a sequence or sequence-like data structure. As such, machine learning, knowledge structuring or representation, decision making, pattern recognition, and/or other artificial intelligence functionalities may include a structure of Nodes **852** and/or Connections **853** organized as a sequence. In some aspects, Connections **853** may be optionally omitted from a sequence as the sequential order of Nodes **852** in a sequence may be implied in the structure. A sequence can be utilized as a predictive modeling approach in machine learning. Nodes **852**, Connections **853**, and/or other elements or operations of a sequence may include any features, functionalities, and embodiments of the aforementioned Nodes **852**, Connections **853**, and/or other elements or operations of a neural network, graph, and/or tree, and vice versa. An exemplary embodiment of a sequence (i.e. Collection of Sequences **530***c*, Sequence **533**, etc.) is described later.

In yet another example, the disclosed artificially intelligent systems, devices, and methods for learning and/or using visual surrounding for autonomous device operation may include a search-based model and/or technique. As such, machine learning, knowledge structuring or representation, decision making, pattern recognition, and/or other artificial intelligence functionalities may include searching through a collection of possible solutions. For example, a search method can search through a neural network, graph, tree, sequence, or other data structure that includes data elements of interest. A search may use heuristics to limit the search for solutions by eliminating choices that are unlikely to lead to the goal. Heuristic techniques may provide a best guess solution. A search can also include optimization. For example, a search may begin with a guess and then refine the guess incrementally until no more refinements can be made. In a further example, the disclosed systems, devices, and methods may include logic-based model and/or technique. As such, machine learning, knowledge structuring or representation, decision making, pattern recognition, and/or other artificial intelligence functionalities can use formal or other type of logic. Logic based models may involve making inferences or deriving conclusions from a set of premises. As such, a logic based system can extend existing knowledge or create new knowledge automatically using inferences. Examples of the types of logic that can be utilized include propositional or sentential logic that comprises logic of statements which can be true or false; first-order logic that allows the use of quantifiers and predicates and that can express facts about objects, their properties, and their relations with each other; fuzzy logic that allows degrees of truth to be represented as a value between 0 and 1 rather than simply 0 (false) or 1 (true), which can be used for uncertain reasoning; subjective logic that comprises a type of probabilistic logic that may take uncertainty and belief into account, which can be suitable for modeling and analyzing situations involving uncertainty, incomplete knowledge and different world views; and/or other types of logic. In a further example, the disclosed systems, devices, and methods may include a probabilistic model and/or technique. As such, machine learning, knowledge structuring or representation, decision making, pattern recognition, and/or other artificial intelligence functionalities can be implemented to operate with incomplete or uncertain information where probabilities may affect outcomes. Bayesian network, among other models, is an example of a probabilistic tool used for purposes such as reasoning, learning, planning, perception, and/or others. One of ordinary skill in art will understand that the aforementioned artificial intelligence models and/or techniques are described merely as examples of a variety of possible implementations, and that while all possible artificial intelligence models and/or techniques are too voluminous to describe, other artificial intelligence models and/or techniques known in art are within the scope of this disclosure. One of ordinary skill in art will also recognize that an intelligent system may solve a specific problem by using any model and/or technique that works such as, for example, some systems can be symbolic and logical, some can be sub-symbolic neural networks, some can be deterministic or probabilistic, some can be hierarchical, some may include searching techniques, some may include optimization techniques, while others may use other or a combination of models and/or techniques. In general, any artificial intelligence model and/or technique can be utilized that can facilitate the functionalities described herein.

Referring to FIGS. **17**A-**17**C, embodiments of interconnected Knowledge Cells **800** and updating weights of Connections **853** are illustrated. As shown for example in FIG. **17**A, Knowledge Cell **800***za* is connected to Knowledge Cell **800***zb* and Knowledge Cell **800***zc* by Connection **853***z***1** and Connection **853***z***2**, respectively. Each of Connection **853***z***1** and Connection **853***z***2** may include or be associated with occurrence count, weight, and/or other parameter or data. The number of occurrences may track or store the number of observations that a Knowledge Cell **800** was followed by another Knowledge Cell **800** indicating a connection or relationship between them. For example, Knowledge Cell **800***za* was followed by Knowledge Cell **800***zb* 10 times as indicated by the number of occurrences of Connection **853***z***1**. Also, Knowledge Cell **800***za* was followed by Knowledge Cell **800***zc* times as indicated by the number of occurrences of Connection **853***z***2**. The weight of Connection **853***z***1** can be calculated or determined as the number of occurrences of Connection **853***z***1** divided by the sum of occurrences of all connections (i.e. Connection **853***z***1** and Connection **853***z***2**, etc.) originating from Knowledge Cell **800***za*. Therefore, the weight of Connection **853***z***1** can be calculated or determined as 10/(10+15)=0.4, for example. Also, the weight of Connection **853***z***2** can be calculated or determined as 15/(10+15)=0.6, for example. Therefore, the sum of weights of Connection **853***z***1**, Connection **853***z***2**, and/or any other Connections **853** originating from Knowledge Cell **800***za* may equal to 1 or 100%. As shown for example in FIG. **17**B, in the case that Knowledge Cell **800***zd* is inserted and an observation is made that Knowledge Cell **800***zd* follows Knowledge Cell **800***za*, Connection **853***z***3** can be created between Knowledge Cell **800***za* and Knowledge Cell **800***zd*. The occurrence count of Connection **853***z***3** can be set to 1 and weight determined as 1/(10+15+1)=0.038. The weights of all other connections (i.e. Connection **853***z***1**, Connection **853***z***2**, etc.) originating from Knowledge Cell **800***za* may be updated to account for the creation of Connection **853***z***3**. Therefore, the weight of Connection **853***z***1** can be updated as 10/(10+15+1)=0.385. The weight

of Connection **853***z***2** can also be updated as 15/(10+15+1)=0.577. As shown for example in FIG. **17**C, in the case that an additional occurrence of Connection **853***z***1** is observed (i.e. Knowledge Cell **800***zb* followed Knowledge Cell **800***za*, etc.), occurrence count of Connection **853***z***1** and weights of all connections (i.e. Connection **853***z***1**, Connection **853***z***2**, and Connection **853***z***3**, etc.) originating from Knowledge Cell **800***za* may be updated to account for this observation. The occurrence count of Connection **853***z***1** can be increased by 1 and its weight updated as 11/(11+15+1)=0.407. The weight of Connection **853***z***2** can also be updated as 15/(11+15+1)=0.556. The weight of Connection **853***z***3** can also be updated as 1/(11+15+1)=0.037.

Referring to FIG. **18**, an embodiment of learning Knowledge Cells **800** comprising one or more Digital Pictures **525** correlated with any Instruction Sets **526** and/or Extra Info **527** using Collection of Knowledge Cells **530***d* is illustrated. Collection of Knowledge Cells **530***d* comprises the functionality for storing any number of Knowledge Cells **800**. In some aspects, Knowledge Cells **800** may be stored into or applied onto Collection of Knowledge Cells **530***d* in a learning or training process. In effect, Collection of Knowledge Cells **530***d* may store Knowledge Cells **800** that can later be used to enable autonomous Device **98** operation. In some embodiments, Knowledge Structuring Unit **520** structures or generates Knowledge Cells **800** as previously described and the system applies them onto Collection of Knowledge Cells **530***d*, thereby implementing learning Device's **98** operation in various visual surroundings. The term apply or applying may refer to storing, copying, inserting, updating, or other similar action, therefore, these terms may be used interchangeably herein depending on context. The system can perform Similarity Comparisons **125** (later described) of a newly structured Knowledge Cell **800** from Knowledge Structuring Unit **520** with Knowledge Cells **800** in Collection of Knowledge Cells **530***d*. If a substantially similar Knowledge Cell **800** is not found in Collection of Knowledge Cells **530***d*, the system may insert (i.e. copy, store, etc.) the Knowledge Cell **800** from Knowledge Structuring Unit **520** into Collection of Knowledge Cells **530***d*, for example. On the other hand, if a substantially similar Knowledge Cell **800** is found in Collection of Knowledge Cells **530***d*, the system may optionally omit inserting the Knowledge Cell **800** from Knowledge Structuring Unit **520** as inserting a substantially similar Knowledge Cell **800** may not add much or any additional knowledge to the Collection of Knowledge Cells **530***d*, for example. Also, inserting a substantially similar Knowledge Cell **800** can optionally be omitted to save storage resources and limit the number of Knowledge Cells **800** that may later need to be processed or compared. Any features, functionalities, and embodiments of Similarity Comparison **125**, importance index (later described), similarity index (later described), and/or other disclosed elements can be utilized to facilitate determination of substantial or other similarity and whether to insert a newly structured Knowledge Cell **800** into Collection of Knowledge Cells **530***d*.

For example, the system can perform Similarity Comparisons **125** (later described) of Knowledge Cell **800***ba* from Knowledge Structuring Unit **520** with Knowledge Cells **800** in Collection of Knowledge Cells **530***d*. In the case that a substantially similar match is found between Knowledge Cell **800***ba* and any of the Knowledge Cells **800** in Collection of Knowledge Cells **530***d*, the system may perform no action. The system can then perform Similarity Comparisons **125** of Knowledge Cell **800***bb* from Knowledge Structuring Unit **520** with Knowledge Cells **800** in Collection of Knowledge Cells **530***d*. In the case that a substantially similar match is not found, the system may insert a new Knowledge Cell **800** into Collection of Knowledge Cells **530***d* and copy Knowledge Cell **800***bb* into the inserted new Knowledge Cell **800**. The system can then perform Similarity Comparisons **125** of Knowledge Cell **800***bc* from Knowledge Structuring Unit **520** with Knowledge Cells **800** in Collection of Knowledge Cells **530***d*. In the case that a substantially similar match is found between Knowledge Cell **800***bc* and any of the Knowledge Cells **800** in Collection of Knowledge Cells **530***d*, the system may perform no action. The system can then perform Similarity Comparisons **125** of Knowledge Cell **800***bd* from Knowledge Structuring Unit **520** with Knowledge Cells **800** in Collection of Knowledge Cells **530***d*. In the case that a substantially similar match is not found, the system may insert a new Knowledge Cell **800** into Collection of Knowledge Cells **530***d* and copy Knowledge Cell **800***bd* into the inserted new Knowledge Cell **800**. The system can then perform Similarity Comparisons **125** of Knowledge Cell **800***be* from Knowledge Structuring Unit **520** with Knowledge Cells **800** in Collection of Knowledge Cells **530***d*. In the case that a substantially similar match is not found, the system may insert a new Knowledge Cell **800** into Collection of Knowledge Cells **530***d* and copy Knowledge Cell **800***be* into the inserted new Knowledge Cell **800**. Applying any additional Knowledge Cells **800** from Knowledge Structuring Unit **520** onto Collection of Knowledge Cells **530***d* follows similar logic or process as the above-described.

Referring to FIG. **19**, an embodiment of learning Knowledge Cells **800** comprising one or more Digital Pictures **525** correlated with any Instruction Sets **526** and/or Extra Info **527** using Neural Network **530***a* is illustrated. Neural Network **530***a* includes a number of neurons or Nodes **852** interconnected by Connections **853** as previously described. Knowledge Cells **800** are shown instead of Nodes **852** to simplify the illustration as Node **852** includes a Knowledge Cell **800**, for example. Therefore, Knowledge Cells **800** and Nodes **852** can be used interchangeably herein depending on context. It should be noted that Node **852** may include other elements and/or functionalities instead of or in addition to Knowledge Cell **800**. In some aspects, Knowledge Cells **800** may be stored into or applied onto Neural Network **530***a* individually or collectively in a learning or training process. In some designs, Neural Network **530***a* comprises a number of Layers **854** each of which may include one or more Knowledge Cells **800**. Knowledge Cells **800** in successive Layers **854** can be connected by Connections **853**. Connection **853** may include or be associated with occurrence count, weight, and/or other parameter or data as previously described. Neural Network **530***a* may include any number of Layers **854** comprising any number of Knowledge Cells **800**. In some aspects, Neural Network **530***a* may store Knowledge Cells **800** interconnected by Connections **853** where following a path through the Neural Network **530***a* can later be used to enable autonomous Device **98** operation. It should be understood that, in some embodiments, Knowledge Cells **800** in one Layer **854** of Neural Network **530***a* need not be connected only with Knowledge Cells **800** in a successive Layer **854**, but also in any other Layer **854**, thereby creating shortcuts (i.e. shortcut Connections **853**, etc.) through Neural Network **530***a*. A Knowledge Cell **800** can also be connected to itself such as, for example, in recurrent neural networks. In general, any Knowledge Cell **800** can be connected with any other Knowledge Cell **800** anywhere else in Neural Network **530***a*. In further embodiments, back-propagation of any data or information can be

implemented. In one example, back-propagation of similarity (i.e. similarity index, etc.) of compared Knowledge Cells **800** in a path through Neural Network **530***a* can be implemented. In another example, back-propagation of errors can be implemented. Such back-propagations can then be used to adjust occurrence counts and/or weights of Connections **853** for better future predictions, for example. Any other back-propagation can be implemented for other purposes. Any combination of Nodes **852** (i.e. Nodes **852** comprising Knowledge Cells **800**, etc.), Connections **853**, Layers **854**, and/or other elements or techniques can be implemented in alternate embodiments. Neural Network **530***a* may include any type or form of a neural network known in art such as a feed-forward neural network, a back-propagating neural network, a recurrent neural network, a convolutional neural network, deep neural network, and/or others including a custom neural network.

In some embodiments, Knowledge Structuring Unit **520** structures or generates Knowledge Cells **800** and the system applies them onto Neural Network **530***a*, thereby implementing learning Device's **98** operation in various visual surroundings. The system can perform Similarity Comparisons **125** (later described) of a Knowledge Cell **800** from Knowledge Structuring Unit **520** with Knowledge Cells **800** in a corresponding Layer **854** of Neural Network **530***a*. If a substantially similar Knowledge Cell **800** is not found in the corresponding Layer **854** of Neural Network **530***a*, the system may insert (i.e. copy, store, etc.) the Knowledge Cell **800** from Knowledge Structuring Unit **520** into the corresponding Layer **854** of Neural Network **530***a*, and create a Connection **853** to the inserted Knowledge Cell **800** from a Knowledge Cell **800** in a prior Layer **854** including assigning an occurrence count to the new Connection **853**, calculating a weight of the new Connection **853**, and updating any other Connections **853** originating from the Knowledge Cell **800** in the prior Layer **854**. On the other hand, if a substantially similar Knowledge Cell **800** is found in the corresponding Layer **854** of Neural Network **530***a*, the system may update occurrence count and weight of Connection **853** to that Knowledge Cell **800** from a Knowledge Cell **800** in a prior Layer **854**, and update any other Connections **853** originating from the Knowledge Cell **800** in the prior Layer **854**.

For example, the system can perform Similarity Comparisons **125** (later described) of Knowledge Cell **800***ba* from Knowledge Structuring Unit **520** with Knowledge Cells **800** in Layer **854***a* of Neural Network **530***a*. In the case that a substantially similar match is found between Knowledge Cell **800***ba* and Knowledge Cell **800***ea*, the system may perform no action since Knowledge Cell **800***ea* is the initial Knowledge Cell **800**. The system can then perform Similarity Comparisons **125** of Knowledge Cell **800***bb* from Knowledge Structuring Unit **520** with Knowledge Cells **800** in Layer **854***b* of Neural Network **530***a*. In the case that a substantially similar match is found between Knowledge Cell **800***bb* and Knowledge Cell **800***eb*, the system may update occurrence count and weight of Connection **853***e***1** between Knowledge Cell **800***ea* and Knowledge Cell **800***eb*, and update weights of other Connections **853** originating from Knowledge Cell **800***ea* as previously described. The system can then perform Similarity Comparisons **125** of Knowledge Cell **800***bc* from Knowledge Structuring Unit **520** with Knowledge Cells **800** in Layer **854***c* of Neural Network **530***a*. In the case that a substantially similar match is not found, the system may insert Knowledge Cell **800***ec* into Layer **854***c* and copy Knowledge Cell **800***bc* into the inserted Knowledge Cell **800***ec*. The system may also create Connection **853***e***2** between Knowledge Cell **800***eb* and Knowledge Cell **800***ec* with occurrence count of 1 and weight calculated based on the occurrence count as previously described. The system may also update weights of other Connections **853** (one in this example) originating from Knowledge Cell **800***eb* as previously described. The system can then perform Similarity Comparisons **125** of Knowledge Cell **800***bd* from Knowledge Structuring Unit **520** with Knowledge Cells **800** in Layer **854***d* of Neural Network **530***a*. In the case that a substantially similar match is not found, the system may insert Knowledge Cell **800***ed* into Layer **854***d* and copy Knowledge Cell **800***bd* into the inserted Knowledge Cell **800***ed*. The system may also create Connection **853***e***3** between Knowledge Cell **800***ec* and Knowledge Cell **800***ed* with occurrence count of 1 and weight of 1. The system can then perform Similarity Comparisons **125** of Knowledge Cell **800***be* from Knowledge Structuring Unit **520** with Knowledge Cells **800** in Layer **854***e* of Neural Network **530***a*. In the case that a substantially similar match is not found, the system may insert Knowledge Cell **800***ee* into Layer **854***e* and copy Knowledge Cell **800***be* into the inserted Knowledge Cell **800***ee*. The system may also create Connection **853***e***4** between Knowledge Cell **800***ed* and Knowledge Cell **800***ee* with occurrence count of 1 and weight of 1. Applying any additional Knowledge Cells **800** from Knowledge Structuring Unit **520** onto Neural Network **530***a* follows similar logic or process as the above-described.

Similarity Comparison **125** comprises the functionality for comparing or matching Knowledge Cells **800** or portions thereof, and/or other functionalities. Similarity Comparison **125** comprises the functionality for comparing or matching Digital Pictures **525** or portions thereof. Similarity Comparison **125** comprises the functionality for comparing or matching streams of Digital Pictures **525** or portions thereof. Similarity Comparison **125** comprises the functionality for comparing or matching Instruction Sets **526**, Extra Info **527**, text (i.e. characters, words, phrases, etc.), pictures, sounds, data, and/or other elements or portions thereof. Similarity Comparison **125** may include functions, rules, and/or logic for performing matching or comparisons and for determining that while a perfect match is not found, a similar or partial match has been found. In some aspects, Similarity Comparison **125** may include determining substantial similarity or substantial match of compared elements. In other aspects, a partial match may include a substantial or otherwise similar match, and vice versa. Although, substantial similarity or substantial match is frequently used herein, it should be understood that any level of similarity, however high or low, may be utilized as defined by the rules (i.e. thresholds, etc.) for similarity. The rules for similarity or similar match can be defined by a user, by VSADO system administrator, or automatically by the system based on experience, testing, inquiry, analysis, synthesis, or other techniques, knowledge, or input. In some designs, Similarity Comparison **125** comprises the functionality to automatically define appropriately strict rules for determining similarity of the compared elements. Similarity Comparison **125** can therefore set, reset, and/or adjust the strictness of the rules for finding or determining similarity of the compared elements, thereby fine tuning Similarity Comparison **125** so that the rules for determining similarity are appropriately strict. In some aspects, the rules for determining similarity may include a similarity threshold. As such, Similarity Comparison **125** can determine similarity of compared elements if their similarity exceeds a similarity threshold. In other aspects, the rules for determining similarity may

include a difference threshold. As such, Similarity Comparison **125** can determine similarity of compared elements if their difference is lower than a difference threshold. In further aspects, the rules for determining similarity may include other thresholds.

In some embodiments, in determining similarity of Knowledge Cells **800**, Similarity Comparison **125** can compare one or more Digital Pictures **525** or portions (i.e. regions, features, pixels, etc.) thereof from one Knowledge Cell **800** with one or more Digital Pictures **525** or portions thereof from another Knowledge Cell **800**. In some aspects, total equivalence is achieved when all Digital Pictures **525** or portions thereof of the compared Knowledge Cells **800** match. If total equivalence is not found, Similarity Comparison **125** may attempt to determine substantial or other similarity. Any features, functionalities, and embodiments of the previously described Picture Recognizer **350** can be used in determining such substantial similarity.

In some embodiments where compared Knowledge Cells **800** include a single Digital Picture **525**, Similarity Comparison **125** can compare Digital Picture **525** from one Knowledge Cell **800** with Digital Picture **525** from another Knowledge Cell **800** using comparison techniques for individual pictures described below. In some embodiments where compared Knowledge Cells **800** include streams of Digital Pictures **525** (i.e. motion pictures, videos, etc.), Similarity Comparison **125** can compare a stream of Digital Pictures **525** from one Knowledge Cell **800** with a stream of Digital Pictures **525** from another Knowledge Cell **800**. Such comparison may include comparing Digital Pictures **525** from one Knowledge Cell **800** with corresponding (i.e. similarly positioned, temporally related, etc.) Digital Pictures **525** from another Knowledge Cell **800**. In one example, a 67th Digital Picture **525** from one Knowledge Cell **800** can be compared with a 67th Digital Picture **525** from another Knowledge Cell **800**. In another example, a 67th Digital Picture **525** from one Knowledge Cell **800** can be compared with a number of Digital Picture **525** around (i.e. preceding and/or following) a 67th Digital Picture **525** from another Knowledge Cell **800**. This way, flexibility can be implemented in finding a substantially similar Digital Picture **525** if the Digital Pictures **525** in the compared Knowledge Cells **800** are not perfectly aligned. In other aspects, Similarity Comparison **125** can utilize Dynamic Time Warping (DTW) and/or other techniques know in art for comparing and/or aligning temporal sequences (i.e. streams of Digital Pictures **525**, etc.) that may vary in time or speed. Once the corresponding (i.e. similarly positioned, temporally related, time warped/aligned, etc.) Digital Pictures **525** in the compared streams of Digital Pictures **525** are compared and their substantial similarity determined using comparison techniques for individual pictures described below, Similarity Comparison **125** can utilize a threshold for the number or percentage of matching or substantially matching Digital Pictures **525** for determining substantial similarity of the compared Knowledge Cells **800**. In some aspects, substantial similarity can be achieved when most of the Digital Pictures **525** or portions (i.e. regions, features, pixels, etc.) thereof of the compared Knowledge Cells **800** match or substantially match. In other aspects, substantial similarity can be achieved when at least a threshold number or percentage of Digital Pictures **525** or portions thereof of the compared Knowledge Cells **800** match or substantially match. Similarly, substantial similarity can be achieved when a number or percentage of matching or substantially matching Digital Pictures **525** or portions thereof of the compared Knowledge Cells **800** exceeds a threshold. In further aspects, substantial similarity can be achieved when all but a threshold number or percentage of Digital Pictures **525** or portions thereof of the compared Knowledge Cells **800** match or substantially match. Such thresholds can be defined by a user, by VSADO system administrator, or automatically by the system based on experience, testing, inquiry, analysis, synthesis, or other techniques, knowledge, or input. In one example, substantial similarity can be achieved when at least 1, 2, 3, 4, or any other threshold number of Digital Pictures **525** or portions thereof of the compared Knowledge Cells **800** match or substantially match. Similarly, substantial similarity can be achieved when the number of matching or substantially matching Digital Pictures **525** or portions thereof of the compared Knowledge Cells **800** exceeds 1, 2, 3, 4, or any other threshold number. In another example, substantial similarity can be achieved when at least 10%, 21%, 30%, 49%, 66%, 89%, 93%, or any other percentage of Digital Pictures **525** or portions thereof of the compared Knowledge Cells **800** match or substantially match. Similarly, substantial similarity can be achieved when the percentage of matching or substantially matching Digital Pictures **525** or portions thereof of the compared Knowledge Cells **800** exceeds 10%, 21%, 30%, 49%, 66%, 89%, 93%, or any other threshold percentage. In other embodiments, substantial similarity of the compared Knowledge Cells **800** can be achieved in terms of matches or substantial matches in more important (i.e. as indicated by importance index [later described], etc.) Digital Pictures **525** or portions thereof, thereby tolerating mismatches in less important Digital Pictures **525** or portions thereof. In one example, substantial similarity can be achieved when matches or substantial matches are found with respect to more substantive Digital Pictures **525** (i.e. pictures comprising content of interest [i.e. persons, objects, etc.], etc.) or portions thereof of the compared Knowledge Cells **800**, thereby tolerating mismatches in less substantive Digital Pictures **525** (i.e. pictures comprising background, insignificant content, etc.) or portions thereof. In another example, substantial similarity can be achieved when matches or substantial matches are found in earlier Digital Pictures **525** or portions thereof of the compared Knowledge Cells **800**, thereby tolerating mismatches in later Digital Pictures **525** or portions thereof. In general, any importance or weight can be assigned to any Digital Picture **525** or portion thereof, and/or other elements. In some designs, Similarity Comparison **125** can be configured to omit any Digital Picture **525** or portion thereof from the comparison. In one example, less substantive Digital Pictures **525** or portions thereof can be omitted. In another example, some or all Digital Pictures **525** or portions thereof related to a specific time period can be omitted. In a further example, later Digital Pictures **525** or portions thereof can be omitted. In further embodiments, substantial similarity can be achieved taking into account the number of Digital Pictures **525** of the compared Knowledge Cells **800**. For example, substantial similarity can be achieved if the number, in addition to the content, of Digital Pictures **525** of the compared Knowledge Cells **800** match or substantially match. In further embodiments, substantial similarity can be achieved taking into account the objects detected within Digital Pictures **525** and/or other features of Digital Pictures **525** of the compared Knowledge Cells **800**. For example, substantial similarity can be achieved if same or similar objects are detected in Digital Pictures **525** of the compared Knowledge Cells **800**. Any features, functionalities, and embodiments of Picture Recognizer **350** can be used in such detection. In some aspects, Similarity Comparison **125** can

compare the number, objects detected, and/or other features of Digital Pictures **525** as an initial check before proceeding to further detailed comparisons.

Similarity Comparison **125** can automatically adjust (i.e. increase or decrease) the strictness of the rules for determining substantial similarity of Knowledge Cells **800**. In some aspects, such adjustment in strictness can be done by Similarity Comparison **125** in response to determining that total equivalence of compared Knowledge Cells **800** had not been found. Similarity Comparison **125** can keep adjusting the strictness of the rules until substantially similarity is found. All the rules or settings of substantial similarity can be set, reset, or adjusted by Similarity Comparison **125** in response to another strictness level determination. For example, Similarity Comparison **125** may attempt to find a match or substantial match in a certain percentage (i.e. 95%, etc.) of Digital Pictures **525** or portions thereof from the compared Knowledge Cells **800**. If the comparison does not determine substantial similarity of compared Knowledge Cells **800**, Similarity Comparison **125** may decide to decrease the strictness of the rules. In response, Similarity Comparison **125** may attempt to find fewer matching or substantially matching Digital Pictures **525** or portions thereof than in the previous attempt using stricter rules. If the comparison still does not determine substantial similarity of compared Knowledge Cells **800**, Similarity Comparison **125** may further decrease (i.e. down to a certain minimum strictness or threshold, etc.) the strictness by requiring fewer Digital Pictures **525** or portions thereof to match or substantially match, thereby further increasing a chance of finding substantial similarity in compared Knowledge Cells **800**. In further aspects, an adjustment in strictness can be done by Similarity Comparison **125** in response to determining that multiple substantially similar Knowledge Cells **800** had been found. Similarity Comparison **125** can keep adjusting the strictness of the rules until a best of the substantially similar Knowledge Cells **800** is found. For example, Similarity Comparison **125** may attempt to find a match or substantial match in a certain percentage (i.e. 70%, etc.) of Digital Pictures **525** or portions thereof from the compared Knowledge Cells **800**. If the comparison determines a number of substantially similar Knowledge Cells **800**, Similarity Comparison **125** may decide to increase the strictness of the rules to decrease the number of substantially similar Knowledge Cells **800**. In response, Similarity Comparison **125** may attempt to find more matching or substantially matching Digital Pictures **525** or portions thereof in addition to the earlier found Digital Pictures **525** or portions thereof to limit the number of substantially similar Knowledge Cells **800**. If the comparison still provides more than one substantially similar Knowledge Cell **800**, Similarity Comparison **125** may further increase the strictness by requiring additional Digital Pictures **525** or portions thereof to match or substantially match, thereby further narrowing the number of substantially similar Knowledge Cells **800** until a best substantially similar Knowledge Cells **800** is found.

In some embodiments, in determining substantial similarity of individual Digital Pictures **525** (i.e. Digital Pictures **525** from the compared Knowledge Cells **800**, etc.), Similarity Comparison **125** can compare one or more regions of one Digital Picture **525** with one or more regions of another Digital Picture **525**. A region may include a collection of pixels. In some aspects, a region may include detected or recognized content of interest such as an object or person. Such region may be detected using any features, functionalities, and embodiments of Picture Recognizer **350**. In other aspects, a region may include content defined using a picture segmentation technique. Examples of picture segmentation techniques include thresholding, clustering, region-growing, edge detection, curve propagation, level sets, graph partitioning, model-based segmentation, trainable segmentation (i.e. artificial neural networks, etc.), and/or others. In further aspects, a region may include content defined using any technique. In further aspects, a region may include any arbitrary region comprising any arbitrary content. Once regions of the compared Digital Pictures **525** are known, Similarity Comparison **125** can compare the regions to determine substantial similarity of the compared Digital Pictures **525**. In some aspects, total equivalence is found when all regions of one Digital Picture **525** match all regions of another Digital Picture **525**. In other aspects, if total equivalence is not found, Similarity Comparison **125** may attempt to determine substantial similarity of compared Digital Pictures **525**. In one example, substantial similarity can be achieved when most of the regions of the compared Digital Picture **525** match or substantially match. In another example, substantial similarity can be achieved when at least a threshold number (i.e. 1, 2, 5, 11, 39, etc.) or percentage (i.e. 38%, 63%, 77%, 84%, 98%, etc.) of regions of the compared Digital Pictures **525** match or substantially match. Similarly, substantial similarity can be achieved when the number or percentage of matching or substantially matching regions of the compared Digital Pictures **525** exceeds a threshold number (i.e. 1, 2, 5, 11, 39, etc.) or a threshold percentage (i.e. 48%, 63%, 77%, 84%, 98%, etc.). In a further example, substantial similarity can be achieved when all but a threshold number or percentage of regions of the compared Digital Pictures **525** match or substantially match. Such thresholds can be defined by a user, by VSADO system administrator, or automatically by the system based on experience, testing, inquiry, analysis, synthesis, and/or other techniques, knowledge, or input. In further aspects, Similarity Comparison **125** can utilize the type of regions for determining substantial similarity of Digital Pictures **525**. For example, substantial similarity can be achieved when matches or substantial matches are found with respect to more substantive, larger, and/or other regions, thereby tolerating mismatches in less substantive, smaller, and/or other regions. In further aspects, Similarity Comparison **125** can utilize the importance (i.e. as indicated by importance index [later described], etc.) of regions for determining substantial similarity of Digital Pictures **525**. For example, substantial similarity can be achieved when matches or substantial matches are found with respect to more important regions such as the above described more substantive, larger, and/or other regions, thereby tolerating mismatches in less important regions such as less substantive, smaller, and/or other regions. In further aspects, Similarity Comparison **125** can omit some of the regions from the comparison in determining substantial similarity of Digital Pictures **525**. In one example, isolated regions can be omitted from comparison. In another example, less substantive or smaller regions can be omitted from comparison. In general, any region can be omitted from comparison. In further aspects, Similarity Comparison **125** can focus on certain regions of interest from the compared Digital Pictures **525**. For example, substantial similarity can be achieved when matches or substantial matches are found with respect to regions comprising persons or parts (i.e. head, arm, leg, etc.) thereof, large objects, close objects, and/or other content of interest, thereby tolerating mismatches in regions comprising the background, insignificant content, and/or other content. In further aspects, Similarity Comparison **125** can detect or

recognize persons or objects in the compared Digital Pictures **525** using regions. Any features, functionalities, and embodiments of Picture Recognizer **350** can be used in such detection or recognition. Once a person or object is detected in a Digital Picture **525**, Similarity Comparison **125** may attempt to detect the person or object in the compared Digital Picture **525**. In one example, substantial similarity can be achieved when the compared Digital Pictures **525** comprise one or more same persons or objects. In another example concerning streams of Digital Pictures **525**, substantial similarity can be achieved when the compared streams of Digital Pictures **525** comprise a detected person or object in at least a threshold number or percentage of their pictures.

Similarity Comparison **125** can automatically adjust (i.e. increase or decrease) the strictness of the rules for determining substantial similarity of Digital Pictures **525** using regions. In some aspects, such adjustment in strictness can be done by Similarity Comparison **125** in response to determining that total equivalence of compared Digital Pictures **525** had not been found. Similarity Comparison **125** can keep adjusting the strictness rules until a substantial similarity is found. All the rules or settings of substantial similarity can be set, reset, or adjusted by Similarity Comparison **125** in response to another strictness level determination. For example, Similarity Comparison **125** may attempt to find a match or substantial match in a certain percentage (i.e. 74%, etc.) of regions from the compared Digital Pictures **525**. If the comparison does not determine substantial similarity of compared Digital Pictures **525**, Similarity Comparison **125** may decide to decrease the strictness of the rules. In response, Similarity Comparison **125** may attempt to find fewer matching or substantially matching regions than in the previous attempt using stricter rules. If the comparison still does not determine substantial similarity of compared Digital Pictures **525**, Similarity Comparison **125** may further decrease the strictness (i.e. down to a certain minimum strictness or threshold, etc.) by requiring fewer regions to match or substantially match, thereby further increasing a chance of finding substantial similarity in compared Digital Pictures **525**.

Where a reference to a region is used herein it should be understood that a portion of a region or a collection of regions can be used instead of or in addition to the region. In one example, instead of or in addition to regions, individual pixels and/or features that constitute a region can be compared. In another example, instead of or in addition to regions, collections of regions can be compared. As such, any operations, rules, logic, and/or functions operating on regions similarly apply to any portion of a region and/or any collection of regions. In general, whole regions, portions of a region, and/or collections of regions, including any operations thereon, can be combined to arrive at desired results. Some or all of the above-described rules, logic, and/or techniques can be utilized alone or in combination with each other or with other rules, logic, and/or techniques. One of ordinary skill in art will recognize that other techniques known in art for determining similarity of digital pictures, streams of digital pictures, and/or other data that would be too voluminous to describe are within the scope of this disclosure.

In some embodiments, in determining substantial similarity of individual Digital Pictures **525** (i.e. Digital Pictures **525** from the compared Knowledge Cells **800**, etc.), Similarity Comparison **125** can compare one or more features of one Digital Picture **525** with one or more features of another Digital Picture **525**. A feature may include a collection of pixels. Some of the steps or elements in a feature oriented technique include pre-processing, feature extraction, detection/segmentation, decision-making, and/or others, or a combination thereof, each of which may include its own sub-steps or sub-elements depending on the application. Examples of features that can be used include lines, edges, ridges, corners, blobs, and/or others. Examples of feature extraction techniques include Canny, Sobe, Kayyali, Harris & Stephens et al, SUSAN, Level Curve Curvature, FAST, Laplacian of Gaussian, Difference of Gaussians, Determinant of Hessian, MSER, PCBR, Grey-level Blobs, and/or others. Once features of the compared Digital Pictures **525** are known, Similarity Comparison **125** can compare the features to determine substantial similarity. In some aspects, total equivalence is found when all features of one Digital Picture **525** match all features of another Digital Picture **525**. In other aspects, if total equivalence is not found, Similarity Comparison **125** may attempt to determine substantial similarity of compared Digital Pictures **525**. In one example, substantial similarity can be achieved when most of the features of the compared Digital Picture **525** match or substantially match. In another example, substantial similarity can be achieved when at least a threshold number (i.e. 3, 22, 47, 93, 128, 431, etc.) or percentage (i.e. 49%, 53%, 68%, 72%, 95%, etc.) of features of the compared Digital Pictures **525** match or substantially match. Similarly, substantial similarity can be achieved when the number or percentage of matching or substantially matching features of the compared Digital Pictures **525** exceeds a threshold number (i.e. 3, 22, 47, 93, 128, 431, etc.) or a threshold percentage (i.e. 49%, 53%, 68%, 72%, 95%, etc.). In a further example, substantial similarity can be achieved when all but a threshold number or percentage of features of the compared Digital Pictures **525** match or substantially match. Such thresholds can be defined by a user, by VSADO system administrator, or automatically by the system based on experience, testing, inquiry, analysis, synthesis, and/or other techniques, knowledge, or input. In further aspects, Similarity Comparison **125** can utilize the type of features for determining substantial similarity of Digital Pictures **525**. In one example, substantial similarity can be achieved when matches or substantial matches are found with respect to edges, thereby tolerating mismatches in blobs. In another example, substantial similarity can be achieved when matches or substantial matches are found with respect to more substantive, larger, and/or other features, thereby tolerating mismatches in less substantive, smaller, and/or other features. In further aspects, Similarity Comparison **125** can utilize the importance (i.e. as indicated by importance index [later described], etc.) of features for determining substantial similarity of Digital Pictures **525**. For example, substantial similarity can be achieved when matches or substantial matches are found with respect to more important features such as the above described more substantive, larger, and/or other features, thereby tolerating mismatches in less important features such as less substantive, smaller, and/or other features. In further aspects, Similarity Comparison **125** can omit some of the features from the comparison in determining substantial similarity of Digital Pictures **525**. In one example, isolated features can be omitted from comparison. In another example, less substantive or smaller features can be omitted from comparison. In general, any feature can be omitted from comparison. In further aspects, Similarity Comparison **125** can focus on features in certain regions of interest of the compared Digital Pictures **525**. For example, substantial similarity can be achieved when matches or substantial matches are found with respect to features in

regions comprising persons or parts (i.e. head, arm, leg, etc.) thereof, large objects, close objects, and/or other objects, thereby tolerating mismatches in features of regions comprising the background, insignificant content, and/or other regions. In further aspects, Similarity Comparison **125** can detect or recognize persons or objects in the compared Digital Pictures **525**. Any features, functionalities, and embodiments of Picture Recognizer **350** can be used in such detection or recognition. Once a person or object is detected in a Digital Picture **525**, Similarity Comparison **125** may attempt to detect the person or object in the compared Digital Picture **525**. In one example, substantial similarity can be achieved when the compared Digital Pictures **525** comprise one or more same persons or objects. In another example concerning streams of Digital Pictures **525**, substantial similarity can be achieved when the compared streams of Digital Pictures **525** comprise a detected person or object in at least a threshold number or percentage of their pictures. In further aspects, Similarity Comparison **125** may include identifying and/or analyzing tiled and/or overlapping features, which can then be combined (i.e. similar to some process steps in convolutional neural networks, etc.) and compared to determine substantial similarity of Digital Pictures **525**.

Similarity Comparison **125** can automatically adjust (i.e. increase or decrease) the strictness of the rules for determining substantial similarity of Digital Pictures **525** using features. In some aspects, such adjustment in strictness can be done by Similarity Comparison **125** in response to determining that total equivalence of compared Digital Pictures **525** had not been found. Similarity Comparison **125** can keep adjusting the strictness rules until a substantial similarity is found. All the rules or settings of substantial similarity can be set, reset, or adjusted by Similarity Comparison **125** in response to another strictness level determination. For example, Similarity Comparison **125** may attempt to find a match or substantial match in a certain percentage (i.e. 89%, etc.) of features from the compared Digital Pictures **525**. If the comparison does not determine substantial similarity of compared Digital Pictures **525**, Similarity Comparison **125** may decide to decrease the strictness of the rules. In response, Similarity Comparison **125** may attempt to find fewer matching or substantially matching features than in the previous attempt using stricter rules. If the comparison still does not determine substantial similarity of compared Digital Pictures **525**, Similarity Comparison **125** may further decrease the strictness (i.e. down to a certain minimum strictness or threshold, etc.) by requiring fewer features to match or substantially match, thereby further increasing a chance of finding substantial similarity in compared Digital Pictures **525**.

Where a reference to a feature is used herein it should be understood that a portion of a feature or a collection of features can be used instead of or in addition to the feature. In one example, instead of or in addition to features, individual pixels that constitute a feature can be compared. In another example, instead of or in addition to features, collections of features can be compared. In a further example, levels of features where a feature on one level includes one or more features from another level (i.e. prior level, etc.) can be compared. As such, any operations, rules, logic, and/or functions operating on features similarly apply to any portion of a feature and/or any collection of features. In general, whole features, portions of a feature, and/or collections of features, including any operations thereon, can be combined to arrive at desired results. Some or all of the above-described rules, logic, and/or techniques can be utilized alone or in combination with each other or with other rules, logic, and/or techniques. One of ordinary skill in art will recognize that other techniques known in art for determining similarity of digital pictures, streams of digital pictures, and/or other data that would be too voluminous to describe are within the scope of this disclosure.

In some embodiments, in determining substantial similarity of individual Digital Pictures **525** (i.e. Digital Pictures **525** from the compared Knowledge Cells **800**, etc.), Similarity Comparison **125** can compare pixels of one Digital Picture **525** with pixels of another Digital Picture **525**. In some aspects, total equivalence is found when all pixels of one Digital Picture **525** match all pixels of another Digital Picture **525**. In other aspects, if total equivalence is not found, Similarity Comparison **125** may attempt to determine substantial similarity. In one example, substantial similarity can be achieved when most of the pixels from the compared Digital Pictures **525** match or substantially match. In another example, substantial similarity can be achieved when at least a threshold number (i.e. 449, 2219, 92229, 442990, 1000028, etc.) or percentage (i.e. 39%, 45%, 58%, 72%, 92%, etc.) of pixels from the compared Digital Pictures **525** match or substantially match. Similarly, substantial similarity can be achieved when the number or percentage of matching or substantially matching pixels from the compared Digital Pictures **525** exceeds a threshold number (i.e. 449, 2219, 92229, 442990, 1000028, etc.) or a threshold percentage (i.e. 39%, 45%, 58%, 72%, 92%, etc.). In a further example, substantial similarity can be achieved when all but a threshold number or percentage of pixels from the compared Digital Pictures **525** match or substantially match. Such thresholds can be defined by a user, by VSADO system administrator, or automatically by the system based on experience, testing, inquiry, analysis, synthesis, and/or other techniques, knowledge, or input. In further aspects, Similarity Comparison **125** can omit some of the pixels from the comparison in determining substantial similarity of Digital Pictures **525**. In one example, pixels composing the background or any insignificant content can be omitted from comparison. In general, any pixel can be omitted from comparison. In further aspects, Similarity Comparison **125** can focus on pixels in certain regions of interest in determining substantial similarity of Digital Pictures **525**. For example, substantial similarity can be achieved when matches or substantial matches are found with respect to pixels in regions comprising persons or parts (i.e. head, arm, leg, etc.) thereof, large objects, close objects, and/or other content of interest, thereby tolerating mismatches in pixels in regions comprising the background, insignificant content, and/or other content.

Similarity Comparison **125** can automatically adjust (i.e. increase or decrease) the strictness of the rules for determining substantial similarity of Digital Pictures **525** using pixels. In some aspects, such adjustment in strictness can be done by Similarity Comparison **125** in response to determining that total equivalence of compared Digital Pictures **525** had not been found. Similarity Comparison **125** can keep adjusting the strictness rules until a substantial similarity is found. All the rules or settings of substantial similarity can be set, reset, or adjusted by Similarity Comparison **125** in response to another strictness level determination. For example, Similarity Comparison **125** may attempt to find a match or substantial match in a certain percentage (i.e. 77%, etc.) of pixels from the compared Digital Pictures **525**. If the comparison does not determine substantial similarity of compared Digital Pictures **525**, Similarity Comparison **125** may decide to decrease the

strictness of the rules. In response, Similarity Comparison **125** may attempt to find fewer matching or substantially matching pixels than in the previous attempt using stricter rules. If the comparison still does not determine substantial similarity of compared Digital Pictures **525**, Similarity Comparison **125** may further decrease the strictness (i.e. down to a certain minimum strictness or threshold, etc.) by requiring fewer pixels to match or substantially match, thereby further increasing a chance of finding substantial similarity in compared Digital Pictures **525**.

Where a reference to a pixel is used herein it should be understood that a collection of pixels can be used instead of or in addition to the pixel. For example, instead of or in addition to pixels, collections of pixels can be compared. As such, any operations, rules, logic, and/or functions operating on pixels similarly apply to any collection of pixels. In general, pixels and/or collections of pixels, including any operations thereon, can be combined to arrive at desired results. Some or all of the above-described rules, logic, and/or techniques can be utilized alone or in combination with each other or with other rules, logic, and/or techniques. Any of the previously described features, functionalities, and embodiments of Similarity Comparison **125** for determining substantial similarity of Digital Pictures **525** using regions and/or features can similarly be used for pixels. One of ordinary skill in art will recognize that other techniques known in art for determining similarity of digital pictures, streams of digital pictures, and/or other data that would be too voluminous to describe are within the scope of this disclosure.

Other aspects or properties of digital pictures or pixels can be taken into account by Similarity Comparison **125** in digital picture comparisons. Examples of such aspects or properties include color adjustment, size adjustment, content manipulation, transparency (i.e. alpha channel, etc.), use of mask, and/or others. In some implementations, as digital pictures can be captured by various picture taking equipment, in various environments, and under various lighting conditions, Similarity Comparison **125** can adjust lighting or color of pixels or otherwise manipulate pixels before or during comparison. Lighting or color adjustment (also referred to as gray balance, neutral balance, white balance, etc.) may generally include manipulating or rebalancing the intensities of the colors (i.e. red, green, and/or blue if RGB color model is used, etc.) of one or more pixels. For example, Similarity Comparison **125** can adjust lighting or color of all pixels of one picture to make it more comparable to another picture. Similarity Comparison **125** can also incrementally adjust the pixels such as increasing or decreasing the red, green, and/or blue pixel values by a certain amount in each cycle of comparisons in order to find a substantially similar match at one of the incremental adjustment levels. Any of the publically available, custom, or other lighting or color adjustment techniques or programs can be utilized such as color filters, color balancing, color correction, and/or others. In other implementations, Similarity Comparison **125** can resize or otherwise transform a digital picture before or during comparison. Such resizing or transformation may include increasing or decreasing the number of pixels of a digital picture. For example, Similarity Comparison **125** can increase or decrease the size of a digital picture proportionally (i.e. increase or decrease length and/or width keeping aspect ratio constant, etc.) to equate its size with the size of another digital picture. Similarity Comparison **125** can also incrementally resize a digital picture such as increasing or decreasing the size of the digital picture proportionally by a certain amount in each cycle of comparisons in order to find a substantially similar match at one of the incremental sizes. Any of the publically available, custom, or other digital picture resizing techniques or programs can be utilized such as nearest-neighbor interpolation, bilinear interpolation, bicubic interpolation, and/or others. In further implementations, Similarity Comparison **125** can manipulate content (i.e. all pixels, one or more regions, one or more depicted objects/persons, etc.) of a digital picture before or during comparison. Such content manipulation may include moving, centering, aligning, resizing, transforming, and/or otherwise manipulating content of a digital picture. For example, Similarity Comparison **125** can move, center, or align content of one picture to make it more comparable to another picture. Any of the publically available, custom, or other digital picture manipulation techniques or programs can be utilized such as pixel moving, warping, distorting, aforementioned interpolations, and/or others. In further implementations, in digital pictures comprising transparency features or functionalities, Similarity Comparison **125** can utilize a threshold for acceptable number or percentage transparency difference similar to the below-described threshold for the acceptable color difference. Alternatively, transparency can be applied to one or more pixels of a digital picture and color difference may then be determined between compared pixels taking into account the transparency related color effect. Alternatively, transparent pixels can be excluded from comparison. In further implementations, certain regions or subsets of pixels can be ignored or excluded during comparison using a mask. In general, any region or subset of a picture determined to contain no content of interest can be excluded from comparison using a mask. Examples of such regions or subsets include background, transparent or partially transparent regions, regions comprising insignificant content, or any arbitrary region or subset. Similarity Comparison **125** can perform any other pre-processing or manipulation of digital pictures or pixels before or during comparison.

In any of the comparisons involving digital pictures or pixels, Similarity Comparison **125** can utilize a threshold for acceptable number or percentage difference in determining a match for each compared pixel. A pixel in a digital picture can be encoded using various techniques such as RGB (i.e. red, green, blue), CMYK (i.e. cyan, magenta, yellow, and key [black]), binary value, hexadecimal value, numeric value, and/or others. For instance, in RGB color scheme, each of red, green, and blue colors is encoded with a value 0-255 or its binary equivalent. In one example, a threshold for acceptable difference (i.e. absolute difference, etc.) can be set at 10 for each of the three colors. Therefore, a pixel encoded as R130, G240, B50 matches or is sufficiently similar to a compared pixel encoded as R135, G231, B57 because the differences in all three colors fall within the acceptable difference threshold (i.e. 10 in this example, etc.). Furthermore, a pixel encoded as R130, G240, B50 does not match or is not sufficiently similar to a compared pixel encoded as R143, G231, B57 because the difference in red value falls outside the acceptable difference threshold. Any other number threshold can be used such as 1, 3, 8, 15, 23, 77, 132, 197, 243, and/or others. A threshold for acceptable percentage difference can similarly be utilized such as 0.12%, 2%, 7%, 14%, 23%, 36%, 65%, and/or others. In some aspects, a threshold for acceptable number or percentage difference in red, green, and blue can be set to be different for each color. A similar difference determination can be utilized in pixels encoded in any other color scheme. The aforementioned thresholds can be defined by a user, by VSADO system administrator, or automatically by the sys-

tem based on experience, testing, inquiry, analysis, synthesis, or other techniques, knowledge, or input.

In some embodiments, Similarity Comparison **125** can compare one or more Extra Info **527** (i.e. time information, location information, computed information, observed information, sensory information, contextual information, and/or other information, etc.) in addition to or instead of comparing Digital Pictures **525** or portions thereof in determining substantial similarity of Knowledge Cells **800**. Extra Info **527** can be set to be less, equally, or more important (i.e. as indicated by importance index [later described], etc.) than Digital Pictures **525**, regions, features, pixels, and/or other elements in the comparison. Since Extra Info **527** may include any contextual or other information that can be useful in determining similarity of any compared elements, Extra Info **527** can be used to enhance any of the aforementioned similarity determinations.

In some embodiments, Similarity Comparison **125** can also compare one or more Instruction Sets **526** in addition to or instead of comparing Digital Pictures **525** or portions thereof in determining substantial similarity of Knowledge Cells **800**. In some aspects, Similarity Comparison **125** can compare portions of Instruction Sets **526** to determine substantial similarity of Instruction Sets **526**. Similar thresholds for the number or percentage of matching portions of the compared Instruction Sets **526** can be utilized in Instruction Set **526** comparisons. Such thresholds can be defined by a user, by VSADO system administrator, or automatically by the system based on experience, testing, inquiry, analysis, synthesis, and/or other techniques, knowledge, or input. In other aspects, Similarity Comparison **125** can compare text (i.e. character comparison, word/phrase search/comparison, semantic comparison, etc.) or other data (i.e. bit comparison, object or data structure comparison, etc.) to determine substantial similarity of Instruction Sets **526**. Any other comparison technique can be utilized in comparing Instruction Sets **526** in alternate implementations. Instruction Sets **526** can be set to be less, equally, or more important (i.e. as indicated by importance index [later described], etc.) than Digital Pictures **525**, regions, features, pixels, Extra Info **527**, and/or other elements in the comparison.

In some embodiments, an importance index (not shown) or other importance ranking technique can be used in any of the previously described comparisons or other processing involving elements of different importance. Importance index indicates importance of the element to or with which the index is assigned or associated. For example, importance index may indicate importance of a Knowledge Cell **800**, Digital Picture **525**, Instruction Set **526**, Extra Info **527**, region, feature, and/or other element to or with which the index is assigned or associated. In some aspects, importance index on a scale from 0 to 1 can be utilized, although, any other range can also be utilized. Importance index can be stored in or associated with the element to which the index pertains. Association of importance indexes can be implemented using a table where one column comprises elements and another column comprises their associated importance indexes, for example. Importance indexes of various elements can be defined by a user, by VSADO system administrator, or automatically by the system based on experience, testing, inquiry, analysis, synthesis, or other techniques, knowledge, or input. In one example, a higher Importance index can be assigned to more substantive Digital Pictures **525** (i.e. pictures comprising content of interest [i.e. persons, objects, etc.], etc.). In another example, a higher importance index can be assigned to Digital Pictures **525** that are correlated with Instruction Sets **526**. Any importance index can be assigned to or associated with any element described herein. Any importance ranking technique can be utilized as or instead of importance index in alternate embodiments.

In some embodiments, Similarity Comparison **125** may generate a similarity index (not shown) for any compared elements. Similarity index indicates how well an element is matched with another element. For example, similarity index indicates how well a Knowledge Cell **800**, Digital Picture **527**, Instruction Set **526**, Extra Info **527**, region, feature, and/or other element is matched with a compared element. In some aspects, similarity index on a scale from 0 to 1 can be utilized, although, any other range can also be utilized. Similarity index can be generated by Similarity Comparison **125** whether substantial or other similarity between the compared elements is achieved or not. In one example, similarity index can be determined for a Knowledge Cell **800** based on a ratio/percentage of matched or substantially matched Digital Pictures **525** relative to the number of Digital Pictures **525** in the compared Knowledge Cell **800**. Specifically, similarity index of 0.93 is determined if 93% of Digital Pictures **525** of one Knowledge Cell **800** match or substantially match Digital Pictures **525** of another Knowledge Cell **800**. In some designs, importance (i.e. as indicated by importance index, etc.) of one or more Digital Pictures **525** can be included in the calculation of a weighted similarity index. Similar determination of similarity index can be implemented with Digital Pictures **525**, Instruction Sets **526**, Extra Info **527**, regions, features, pixels, and/or other elements or portions thereof. Any combination of the aforementioned similarity index determinations or calculations can be utilized in alternate embodiments. Any similarity ranking technique can be utilized to determine or calculate similarity index in alternate embodiments.

Referring to FIG. **20**, an embodiment of learning Knowledge Cells **800** comprising one or more Digital Pictures **525** correlated with any Instruction Sets **526** and/or Extra Info **527** using Neural Network **530***a* comprising shortcut Connections **853** is illustrated. In some designs, Knowledge Cells **800** in one Layer **854** of Neural Network **530***a* can be connected with Knowledge Cells **800** in any Layer **854**, not only in a successive Layer **854**, thereby creating shortcuts (i.e. shortcut Connections **853**, etc.) through Neural Network **530***a*. In some aspects, creating a shortcut Connection **853** can be implemented by performing Similarity Comparisons **125** of a Knowledge Cell **800** from Knowledge Structuring Unit **520** with Knowledge Cells **800** in any Layer **854** when applying (i.e. storing, copying, etc.) the Knowledge Cell **800** from Knowledge Structuring Unit **520** onto Neural Network **530***a*. Once created, shortcut Connections **853** enable a wider variety of Knowledge Cells **800** to be considered when selecting a path through Neural Network **530***a*. In some embodiments, Knowledge Structuring Unit **520** structures or generates Knowledge Cells **800** and the system applies them onto Neural Network **530***a*, thereby implementing learning Device's **98** operation in various visual surroundings. The system can perform Similarity Comparisons **125** of a Knowledge Cell **800** from Knowledge Structuring Unit **520** with Knowledge Cells **800** in a corresponding and/or other Layers **854** of Neural Network **530***a*. If a substantially similar Knowledge Cell **800** is not found in the corresponding or other Layers **854** of Neural Network **530***a*, the system may insert (i.e. copy, store, etc.) the Knowledge Cell **800** from Knowledge Structuring Unit **520** into the corresponding (or another) Layer **854** of Neural Network **530***a*, and create a Connection **853** to the inserted Knowledge Cell **800** from a prior Knowledge Cell **800** including assigning an occurrence count to the new Connection **853**,

calculating a weight of the new Connection **853**, and updating any other Connections **853** originating from the prior Knowledge Cell **800**. On the other hand, if a substantially similar Knowledge Cell **800** is found in the corresponding or other Layers **854** of Neural Network **530***a*, the system may update occurrence count and weight of Connection **853** to that Knowledge Cell **800** from a prior Knowledge Cell **800**, and update any other Connections **853** originating from the prior Knowledge Cell **800**. Any of the previously described and/or other techniques for comparing, inserting, updating, and/or other operations on Knowledge Cells **800**, Connections **853**, Layers **854**, and/or other elements can similarly be utilized in Neural Network **530***a* that comprises shortcut Connections **853**.

Referring to FIG. **21**, an embodiment of learning Knowledge Cells **800** comprising one or more Digital Pictures **525** correlated with any Instruction Sets **526** and/or Extra Info **527** using Graph **530***b* is illustrated. In some aspects, any Knowledge Cell **800** can be connected with any other Knowledge Cell **800** in Graph **530***b*. In other aspects, any Knowledge Cell **800** can be connected with itself and/or any other Knowledge Cell **800** in Graph **530***b*. In some embodiments, Knowledge Structuring Unit **520** structures or generates Knowledge Cells **800** and the system applies (i.e. store, copy, etc.) them onto Graph **530***b*, thereby implementing learning Device's **98** operation in various visual surroundings. The system can perform Similarity Comparisons **125** of a Knowledge Cell **800** from Knowledge Structuring Unit **520** with Knowledge Cells **800** in Graph **530***b*. If a substantially similar Knowledge Cell **800** is not found in Graph **530***b*, the system may insert (i.e. copy, store, etc.) the Knowledge Cell **800** from Knowledge Structuring Unit **520** into Graph **530***b*, and create a Connection **853** to the inserted Knowledge Cell **800** from a prior Knowledge Cell **800** including assigning an occurrence count to the new Connection **853**, calculating a weight of the new Connection **853**, and updating any other Connections **853** originating from the prior Knowledge Cell **800**. On the other hand, if a substantially similar Knowledge Cell **800** is found in Graph **530***b*, the system may update occurrence count and weight of Connection **853** to that Knowledge Cell **800** from a prior Knowledge Cell **800**, and update any other Connections **853** originating from the prior Knowledge Cell **800**. Any of the previously described and/or other techniques for comparing, inserting, updating, and/or other operations on Knowledge Cells **800**, Connections **853**, and/or other elements can similarly be utilized in Graph **530***b*.

For example, the system can perform Similarity Comparisons **125** of Knowledge Cell **800***ba* from Knowledge Structuring Unit **520** with Knowledge Cells **800** in Graph **530***b*. In the case that a substantially similar match is not found, the system may insert Knowledge Cell **800***ha* into Graph **530***b* and copy Knowledge Cell **800***ba* into the inserted Knowledge Cell **800***ha*. The system can then perform Similarity Comparisons **125** of Knowledge Cell **800***bb* from Knowledge Structuring Unit **520** with Knowledge Cells **800** in Graph **530***b*. In the case that a substantially similar match is found between Knowledge Cell **800***bb* and Knowledge Cell **800***hb*, the system may create Connection **853***h***1** between Knowledge Cell **800***ha* and Knowledge Cell **800***hb* with occurrence count of 1 and weight of 1. The system can then perform Similarity Comparisons **125** of Knowledge Cell **800***bc* from Knowledge Structuring Unit **520** with Knowledge Cells **800** in Graph **530***b*. In the case that a substantially similar match is found between Knowledge Cell **800***bc* and Knowledge Cell **800***hc*, the system may update occurrence count and weight of Connection **853***h***2** between Knowledge Cell **800***hb* and Knowledge Cell **800***hc*, and update weights of other outgoing Connections **853** (one in this example) originating from Knowledge Cell **800***hb* as previously described. The system can then perform Similarity Comparisons **125** of Knowledge Cell **800***bd* from Knowledge Structuring Unit **520** with Knowledge Cells **800** in Graph **530***b*. In the case that a substantially similar match is not found, the system may insert Knowledge Cell **800***hd* into Graph **530***b* and copy Knowledge Cell **800***bd* into the inserted Knowledge Cell **800***hd*. The system may also create Connection **853***h***3** between Knowledge Cell **800***hc* and Knowledge Cell **800***hd* with occurrence count of 1 and weight calculated based on the occurrence count as previously described. The system may also update weights of other outgoing Connections **853** (one in this example) originating from Knowledge Cell **800***hc* as previously described. The system can then perform Similarity Comparisons **125** of Knowledge Cell **800***be* from Knowledge Structuring Unit **520** with Knowledge Cells **800** in Graph **530***b*. In the case that a substantially similar match is not found, the system may insert Knowledge Cell **800***he* into Graph **530***b* and copy Knowledge Cell **800***be* into the inserted Knowledge Cell **800***he*. The system may also create Connection **853***h***4** between Knowledge Cell **800***hd* and Knowledge Cell **800***he* with occurrence count of 1 and weight of 1. Applying any additional Knowledge Cells **800** from Knowledge Structuring Unit **520** onto Graph **530***b* follows similar logic or process as the above-described.

Referring to FIG. **22**, an embodiment of learning Knowledge Cells **800** comprising one or more Digital Pictures **525** correlated with any Instruction Sets **526** and/or Extra Info **527** using Collection of Sequences **530***c* is illustrated. Collection of Sequences **530***c* comprises the functionality for storing one or more Sequences **533**. Sequence **533** comprises the functionality for storing multiple Knowledge Cells **800**. In some aspects, a Sequence **533** may include Knowledge Cells **800** relating to a single operation of Device **98**. For example, Knowledge Structuring Unit **520** structures or generates Knowledge Cells **800** and the system applies them onto Collection of Sequences **530***c*, thereby implementing learning Device's **98** operation in various visual surroundings. The system can perform Similarity Comparisons **125** of Knowledge Cells **800** from Knowledge Structuring Unit **520** with corresponding Knowledge Cells **800** in Sequences **533** of Collection of Sequences **530***c* to find a Sequence **533** comprising Knowledge Cells **800** that are substantially similar to the Knowledge Cells **800** from Knowledge Structuring Unit **520**. If Sequence **533** comprising such substantially similar Knowledge Cells **800** is not found in Collection of Sequences **530***c*, the system may create a new Sequence **533** comprising the Knowledge Cells **800** from Knowledge Structuring Unit **520** and insert (i.e. copy, store, etc.) the new Sequence **533** into Collection of Sequences **530***c*. On the other hand, if Sequence **533** comprising substantially similar Knowledge Cells **800** is found in Collection of Sequences **530***c*, the system may optionally omit inserting the Knowledge Cells **800** from Knowledge Structuring Unit **520** into Collection of Sequences **530***c* as inserting a similar Sequence **533** may not add much or any additional knowledge. This approach can save storage resources and limit the number of Knowledge Cells **800** that may later need to be processed or compared. In other aspects, a Sequence **533** may include Knowledge Cells **800** relating to a part of an operation of Device **98**. Similar learning process as the above described can be utilized in such implementations. In further aspects, one or more long Sequences **533** each including Knowledge Cells **800** of

multiple operations of Device **98** can be utilized. In one example, Knowledge Cells **800** of all operations can be stored in a single long Sequence **533** in which case Collection of Sequences **530***c* as a separate element can be omitted. In another example, Knowledge Cells **800** of multiple operations can be included in a plurality of long Sequences **533** such as hourly, daily, weekly, monthly, yearly, or other periodic or other Sequences **533**. Similarity Comparisons **125** can be performed by traversing the one or more long Sequences **533** to find a match or substantially similar match. For instance, the system can perform Similarity Comparisons **125** of Knowledge Cells **800** from Knowledge Structuring Unit **520** with corresponding Knowledge Cells **800** in subsequences of a long Sequence **533** in incremental or other traversing pattern to find a subsequence comprising Knowledge Cells **800** that are substantially similar to the Knowledge Cells **800** from Knowledge Structuring Unit **520**. The incremental traversing pattern may start from one end of a long Sequence **533** and move the comparison subsequence up or down one or any number of incremental Knowledge Cells **800** at a time. Other traversing patterns or methods can be employed such as starting from the middle of the Sequence **533** and subdividing the resulting subsequences in a recursive pattern, or any other traversing pattern or method. If a subsequence comprising substantially similar Knowledge Cells **800** is not found in the long Sequence **533**, the system may concatenate or append the Knowledge Cells **800** from Knowledge Structuring Unit **520** to the long Sequence **533**. In further aspects, Connections **853** can optionally be used in Sequence **533** to connect Knowledge Cells **800**. For example, a Knowledge Cell **800** can be connected not only with a next Knowledge Cell **800** in the Sequence **533**, but also with any other Knowledge Cell **800** in the Sequence **533**, thereby creating alternate routes or shortcuts through the Sequence **533**. Any number of Connections **853** connecting any Knowledge Cells **800** can be utilized. Any of the previously described and/or other techniques for comparing, inserting, updating, and/or other operations on Knowledge Cells **800**, Connections **853**, and/or other elements can similarly be utilized in Sequences **533** and/or Collection of Sequences **530***c*.

Any of the previously described data structures or arrangements of Knowledge Cells **800** such as Neural Network **530***a*, Graph **530***b*, Collection of Sequences **530***c*, Sequence **533**, Collection of Knowledge Cells **530***d*, and/or others can be used alone, or in combination with each other or with other elements, in alternate embodiments. In one example, a path in Neural Network **530***a* or Graph **530***b* may include its own separate sequence of Knowledge Cells **800** that are not interconnected with Knowledge Cells **800** in other paths. In another example, a part of a path in Neural Network **530***a* or Graph **530***b* may include a sequence of Knowledge Cells **800** interconnected with Knowledge Cells **800** in other paths, whereas, another part of the path may include its own separate sequence of Knowledge Cells **800** that are not interconnected with Knowledge Cells **800** in other paths. Any other combinations or arrangements of Knowledge Cells **800** can be implemented.

Referring to FIG. **23**, an embodiment of determining anticipatory Instruction Sets **526** from a single Knowledge Cell **800** is illustrated. Knowledge Cell **800** may be part of a Knowledgebase **530** (i.e. Neural Network **530***a*, Graph **530***b*, Collection of Sequences **530***c*, Sequence **533**, Collection of Knowledge Cells **530***d*, etc.) such as Collection of Knowledge Cells **530***d*. Decision-making Unit **540** comprises the functionality for anticipating or determining a device's operation in various visual surroundings. Decision-making Unit **540** comprises the functionality for anticipating or determining Instruction Sets **526** (i.e. anticipatory Instruction Sets **526**, etc.) to be used or executed in Device's **98** autonomous operation based on incoming Digital Pictures **525** of Device's **98** visual surrounding. Decision-making Unit **540** also comprises other disclosed functionalities.

In some aspects, Decision-making Unit **540** may anticipate or determine Instruction Sets **526** (i.e. anticipatory Instruction Sets **526**, etc.) for autonomous Device **98** operation by performing Similarity Comparisons **125** of incoming Digital Pictures **525** or portions thereof from Picture Capturing Apparatus **90** with Digital Pictures **525** or portions thereof from Knowledge Cells **800** in Knowledgebase **530** (i.e. Neural Network **530***a*, Graph **530***b*, Collection of Sequences **530***c*, Sequence **533**, Collection of Knowledge Cells **530***d*, etc.). A Knowledge Cell **800** includes a unit of knowledge (i.e. one or more Digital Pictures **525** correlated with any Instruction Sets **526** and/or Extra Info **527**, etc.) of how Device **98** operated in a visual surrounding as previously described. When Digital Pictures **525** or portions thereof of a similar visual surrounding are detected in the future, Decision-making Unit **540** can anticipate the Instruction Sets **526** (i.e. anticipatory Instruction Sets **526**, etc.) previously learned in a similar visual surrounding, thereby enabling autonomous Device **98** operation. In some aspects, Decision-making Unit **540** can perform Similarity Comparisons **125** of incoming Digital Pictures **525** from Picture Capturing Apparatus **90** with Digital Pictures **525** from Knowledge Cells **800** in Knowledgebase **530** (i.e. Neural Network **530***a*, Graph **530***b*, Collection of Sequences **530***c*, Sequence **533**, Collection of Knowledge Cells **530***d*, etc.). If one or more substantially similar Digital Pictures **525** or portions thereof are found in a Knowledge Cell **800** from Knowledgebase **530**, Instruction Sets **526** (i.e. anticipatory Instruction Sets **526**, etc.) for autonomous Device **98** operation can be anticipated in Instruction Sets **526** correlated with the one or more Digital Pictures **525** from the Knowledge Cell **800**. In some designs, subsequent one or more Instruction Sets **526** for autonomous Device **98** operation can be anticipated in Instruction Sets **526** correlated with subsequent Digital Pictures **525** from the Knowledge Cell **800** (or other Knowledge Cells **800**), thereby anticipating not only current, but also additional future Instruction Sets **526**. Although, Extra Info **527** is not shown in this and/or other figures for clarity of illustration, it should be noted that any Digital Picture **525**, Instruction Set **526**, and/or other element may include or be associated with Extra Info **527** and that Decision-making Unit **540** can utilize Extra Info **527** for enhanced decision making.

For example, Decision-making Unit **540** can perform Similarity Comparisons **125** of Digital Picture **52511** or portion thereof from Picture Capturing Apparatus **90** with Digital Picture **525***a***1** or portion thereof from Knowledge Cell **800***oa*. Digital Picture **525***a***1** or portion thereof from Knowledge Cell **800***oa* may be found substantially similar. Decision-making Unit **540** can anticipate Instruction Sets **526***a***1**-**526***a***3** correlated with Digital Picture **525***a***1**, thereby enabling autonomous Device **98** operation. Decision-making Unit **540** can then perform Similarity Comparisons **125** of Digital Picture **52512** or portion thereof from Picture Capturing Apparatus **90** with Digital Picture **525***a***2** or portion thereof from Knowledge Cell **800***oa*. Digital Picture **525***a***2** or portion thereof from Knowledge Cell **800***oa* may be found substantially similar. Decision-making Unit **540** can anticipate Instruction Set **526***a***4** correlated with Digital Picture **525***a***2**, thereby enabling autonomous Device **98** operation. Decision-making Unit **540** can then perform

Similarity Comparisons **125** of Digital Picture **52513** or portion thereof from Picture Capturing Apparatus **90** with Digital Picture **525***a***3** or portion thereof from Knowledge Cell **800***oa*. Digital Picture **525***a***3** or portion thereof from Knowledge Cell **800***oa* may be found substantially similar. Decision-making Unit **540** may not anticipate any Instruction Sets **526** since none are correlated with Digital Picture **525***a***3**. Decision-making Unit **540** can then perform Similarity Comparisons **125** of Digital Picture **52514** or portion thereof from Picture Capturing Apparatus **90** with Digital Picture **525***a***4** or portion thereof from Knowledge Cell **800***oa*. Digital Picture **525***a***4** or portion thereof from Knowledge Cell **800***oa* may not be found substantially similar. Decision-making Unit **540** can then perform Similarity Comparisons **125** of Digital Picture **52515** or portion thereof from Picture Capturing Apparatus **90** with Digital Picture **525***a***5** or portion thereof from Knowledge Cell **800***oa*. Digital Picture **525***a***5** or portion thereof from Knowledge Cell **800***oa* may not be found substantially similar. Decision-making Unit **540** can implement similar logic or process for any additional Digital Picture **525** from Picture Capturing Apparatus **90**, and so on.

It should be understood that any of the described elements and/or techniques in the foregoing example can be omitted, used in a different combination, or used in combination with other elements and/or techniques, in which case the selection of Knowledge Cells **800** or elements (i.e. Digital Pictures **525**, Instruction Sets **526**, etc.) thereof would be affected accordingly. In one example, Extra Info **527** can be included in the Similarity Comparisons **125** as previously described. In another example, as history of incoming Digital Pictures **525** becomes available, Decision-making Unit **540** can perform collective Similarity Comparisons **125** of the history of Digital Pictures **525** or portions thereof from Picture Capturing Apparatus **90** with subsequences of Digital Pictures **525** or portions thereof from Knowledge Cell **800**. In a further example, the described comparisons in a single Knowledge Cell **800** may be performed on any number of Knowledge Cells **800** sequentially or in parallel. Parallel processors such as a plurality of Processors **11** or cores thereof can be utilized for such parallel processing. In a further example, various arrangements of Digital Pictures **525** and/or other elements in a Knowledge Cell **800** can be utilized as previously described. One of ordinary skill in art will understand that the foregoing exemplary embodiment is described merely as an example of a variety of possible implementations, and that while all of its variations are too voluminous to describe, they are within the scope of this disclosure.

Referring to FIG. **24**, an embodiment of determining anticipatory Instruction Sets **526** by traversing a single Knowledge Cell **800** is illustrated. Knowledge Cell **800** may be part of a Knowledgebase **530** (i.e. Neural Network **530***a*, Graph **530***b*, Collection of Sequences **530***c*, Sequence **533**, Collection of Knowledge Cells **530***d*, etc.) such as Collection of Knowledge Cells **530***d*. For example, Decision-making Unit **540** can perform Similarity Comparisons **125** of Digital Picture **52511** or portion thereof from Picture Capturing Apparatus **90** with Digital Picture **525***a***1** or portion thereof from Knowledge Cell **800***oa*. Digital Picture **525***a***1** or portion thereof from Knowledge Cell **800***oa* may not be found substantially similar. Decision-making Unit **540** can then perform Similarity Comparisons **125** of Digital Picture **52511** or portion thereof from Picture Capturing Apparatus **90** with Digital Picture **525***a***2** or portion thereof from Knowledge Cell **800***oa*. Digital Picture **525***a***2** or portion thereof from Knowledge Cell **800***oa* may not be found substantially similar. Decision-making Unit **540** can then perform Similarity Comparisons **125** of Digital Picture **52511** or portion thereof from Picture Capturing Apparatus **90** with Digital Picture **525***a***3** or portion thereof from Knowledge Cell **800***oa*. Digital Picture **525***a***3** or portion thereof from Knowledge Cell **800***oa* may be found substantially similar. Decision-making Unit **540** may not anticipate any Instruction Sets **526** since none are correlated with Digital Picture **525***a***3**. Decision-making Unit **540** can then perform Similarity Comparisons **125** of Digital Picture **52512** or portion thereof from Picture Capturing Apparatus **90** with Digital Picture **525***a***4** or portion thereof from Knowledge Cell **800***oa*. Digital Picture **525***a***4** or portion thereof from Knowledge Cell **800***oa* may be found substantially similar. Decision-making Unit **540** can anticipate Instruction Sets **526***a***5**-**526***a***6** correlated with Digital Picture **525***a***4**, thereby enabling autonomous Device **98** operation. Decision-making Unit **540** can then perform Similarity Comparisons **125** of Digital Picture **52513** or portion thereof from Picture Capturing Apparatus **90** with Digital Picture **525***a***5** or portion thereof from Knowledge Cell **800***oa*. Digital Picture **525***a***5** or portion thereof from Knowledge Cell **800***oa* may be found substantially similar. Decision-making Unit **540** may not anticipate any Instruction Sets **526** since none are correlated with Digital Picture **525***a***5**. Decision-making Unit **540** can implement similar logic or process for any additional Digital Pictures **525** from Picture Capturing Apparatus **90**, and so on.

It should be understood that any of the described elements and/or techniques in the foregoing example can be omitted, used in a different combination, or used in combination with other elements and/or techniques, in which case the selection of Knowledge Cells **800** or elements (i.e. Digital Pictures **525**, Instruction Sets **526**, etc.) thereof would be affected accordingly. In one example, Extra Info **527** can be included in the Similarity Comparisons **125** as previously described. In another example, as history of incoming Digital Pictures **525** becomes available, Decision-making Unit **540** can perform collective Similarity Comparisons **125** of the history of Digital Pictures **525** or portions thereof from Picture Capturing Apparatus **90** with subsequences of Digital Pictures **525** or portions thereof from Knowledge Cell **800**. In a further example, traversing may be performed in incremental traversing pattern such as starting from one end of Knowledge Cell **800** and moving the comparison subsequence up or down the list one or any number of incremental Digital Pictures **525** at a time. Other traversing patterns or methods can be employed such as starting from the middle of the Knowledge Cell **800** and subdividing the resulting subsequence in a recursive pattern, or any other traversing pattern or method. In a further example, the described traversing of a single Knowledge Cell **800** may be performed on any number of Knowledge Cells **800** sequentially or in parallel. Parallel processors such as a plurality of Processors **11** or cores thereof can be utilized for such parallel processing. In a further example, various arrangements of Digital Pictures **525** and/or other elements in a Knowledge Cell **800** can be utilized as previously described. One of ordinary skill in art will understand that the foregoing exemplary embodiment is described merely as an example of a variety of possible implementations, and that while all of its variations are too voluminous to describe, they are within the scope of this disclosure.

Referring to FIG. **25**, an embodiment of determining anticipatory Instruction Sets **526** using collective similarity comparisons is illustrated. For example, Decision-making Unit **540** can perform Similarity Comparisons **125** of Digital

Picture **52511** or portion thereof from Picture Capturing Apparatus **90** with corresponding Digital Pictures **525** or portions thereof from Knowledge Cells **800** in Collection of Knowledge Cells **530***d*. Digital Picture **525***c***1** or portion thereof from Knowledge Cell **800***rc* may be found substantially similar with highest similarity. Decision-making Unit **540** can anticipate any Instruction Sets **526** (not shown) correlated with Digital Picture **525***c***1**, thereby enabling autonomous Device **98** operation. Decision-making Unit **540** can then perform collective Similarity Comparisons **125** of Digital Pictures **52511-52512** or portions thereof from Picture Capturing Apparatus **90** with corresponding Digital Pictures **525** or portions thereof from Knowledge Cells **800** in Collection of Knowledge Cells **530***d*. Digital Pictures **525***c***1-525***c***2** or portions thereof from Knowledge Cell **800***rc* may be found substantially similar with highest similarity. Decision-making Unit **540** can anticipate any Instruction Sets **526** (not shown) correlated with Digital Picture **525***c***2**, thereby enabling autonomous Device **98** operation. Decision-making Unit **540** can then perform collective Similarity Comparisons **125** of Digital Pictures **52511-52513** or portions thereof from Picture Capturing Apparatus **90** with corresponding Digital Pictures **525** or portions thereof from Knowledge Cells **800** in Collection of Knowledge Cells **530***d*. Digital Pictures **525***d***1-525***d***3** or portions thereof from Knowledge Cell **800***rd* may be found substantially similar with highest similarity. Decision-making Unit **540** can anticipate any Instruction Sets **526** (not shown) correlated with Digital Picture **525***d***3**, thereby enabling autonomous Device **98** operation. Decision-making Unit **540** can then perform collective Similarity Comparisons **125** of Digital Pictures **52511-52514** or portions thereof from Picture Capturing Apparatus **90** with corresponding Digital Pictures **525** or portions thereof from Knowledge Cells **800** in Collection of Knowledge Cells **530***d*. Digital Pictures **525***d***1-525***d***4** or portions thereof from Knowledge Cell **800***rd* may be found substantially similar with highest similarity. Decision-making Unit **540** can anticipate any Instruction Sets **526** (not shown) correlated with Digital Picture **525***d***4**, thereby enabling autonomous Device **98** operation. Decision-making Unit **540** can then perform collective Similarity Comparisons **125** of Digital Pictures **52511-52515** or portions thereof from Picture Capturing Apparatus **90** with corresponding Digital Pictures **525** or portions thereof from Knowledge Cells **800** in Collection of Knowledge Cells **530***d*. Digital Pictures **525***d***1-525***d***5** or portions thereof from Knowledge Cell **800***rd* may be found substantially similar with highest similarity. Decision-making Unit **540** can anticipate any Instruction Sets **526** (not shown) correlated with Digital Picture **525***d***5**, thereby enabling autonomous Device **98** operation. Decision-making Unit **540** can implement similar logic or process for any additional Digital Picture **525** from Picture Capturing Apparatus **90**, and so on.

In some embodiments, various elements and/or techniques can be utilized in the aforementioned similarity determinations with respect to collectively compared Digital Pictures **525** and/or other elements. In some aspects, similarity of collectively compared Digital Pictures **525** can be determined based on similarities or similarity indexes of the individually compared Digital Pictures **525**. In one example, an average of similarities or similarity indexes of individually compared Digital Pictures **525** can be used to determine similarity of collectively compared Digital Pictures **525**. In another example, a weighted average of similarities or similarity indexes of individually compared Digital Pictures **525** can be used to determine similarity of collectively compared Digital Pictures **525**. For instance, to affect the weighting of collective similarity, a higher weight or importance (i.e. importance index, etc.) can be assigned to the similarities or similarity indexes of some (i.e. more substantive, etc.) Digital Pictures **525** and lower for other (i.e. less substantive, etc.) Digital Pictures **525**. Any other higher or lower weight or importance assignment can be implemented. In other aspects, any of the previously described or other thresholds for substantial similarity of individually compared elements can be similarly utilized for collectively compared elements. In one example, substantial similarity of collectively compared Digital Pictures **525** can be achieved when their collective similarity or similarity index exceeds a similarity threshold. In another example, substantial similarity of collectively compared Digital Pictures **525** can be achieved when at least a threshold number or percentage of Digital Pictures **525** or portions thereof of the collectively compared Digital Pictures **525** match or substantially match. Similarly, substantial similarity of collectively compared Digital Pictures **525** can be achieved when a number or percentage of matching or substantially matching Digital Pictures **525** or portions thereof of the collectively compared Digital Pictures **525** exceeds a threshold. Such thresholds can be defined by a user, by VSADO system administrator, or automatically by the system based on experience, testing, inquiry, analysis, synthesis, or other techniques, knowledge, or input. Similar elements and/or techniques as the aforementioned can be used for similarity determinations of other collectively compared elements such as Instruction Sets **526**, Extra Info **527**, Knowledge Cells **800**, and/or others. Similarity determinations of collectively compared elements may include any features, functionalities, and embodiments of Similarity Comparison **125**, and vice versa.

It should be understood that any of the described elements and/or techniques in the foregoing example can be omitted, used in a different combination, or used in combination with other elements and/or techniques, in which case the selection of Knowledge Cells **800** or elements (i.e. Digital Pictures **525**, Instruction Sets **526**, etc.) thereof would be affected accordingly. Any of the elements and/or techniques utilized in other examples or embodiments described herein such as using Extra Info **527** in Similarity Comparisons **125**, traversing of Knowledge Cells **800** or other elements, using history of Digital Pictures **525** or Knowledge Cells **800** for collective Similarity Comparisons **125**, using various arrangements of Digital Pictures **525** and/or other elements in a Knowledge Cell **800**, and/or others can similarly be utilized in this example. One of ordinary skill in art will understand that the foregoing exemplary embodiment is described merely as an example of a variety of possible implementations, and that while all of its variations are too voluminous to describe, they are within the scope of this disclosure.

Referring to FIG. **26**, an embodiment of determining anticipatory Instruction Sets **526** using Neural Network **530***a* is illustrated. In some aspects, determining anticipatory Instruction Sets **526** using Neural Network **530***a* may include selecting a path of Knowledge Cells **800** or elements (i.e. Digital Pictures **525**, Instruction Sets **526**, etc.) thereof through Neural Network **530***a*. Decision-making Unit **540** can utilize various elements and/or techniques for selecting a path through Neural Network **530***a*. Although, these elements and/or techniques are described using Neural Network **530***a* below, they can similarly be used in any Knowledgebase **530** (i.e. Graph **530***b*, Collection of Sequences **530***c*, Sequence **533**, Collection of Knowledge Cells **530***d*, etc.) where applicable.

In some embodiments, Decision-making Unit **540** can utilize similarity index in selecting Knowledge Cells **800** or elements (i.e. Digital Pictures **525**, Instruction Sets **526**, etc.) thereof in a path through Neural Network **530***a*. For instance, similarity index may indicate how well one or more Digital Pictures **525** or portions thereof are matched with one or more other Digital Pictures **525** or portions thereof as previously described. In one example, Decision-making Unit **540** may select a Knowledge Cell **800** comprising one or more Digital Pictures **525** with highest similarity index even if Connection **853** pointing to that Knowledge Cell **800** has less than the highest weight. Therefore, similarity index or other such element or parameter can override or disregard the weight of a Connection **853** or other element. In another example, Decision-making Unit **540** may select a Knowledge Cell **800** comprising one or more Digital Pictures **525** whose similarity index is higher than or equal to a weight of Connection **853** pointing to that Knowledge Cell **800**. In a further example, Decision-making Unit **540** may select a Knowledge Cell **800** comprising one or more Digital Pictures **525** whose similarity index is lower than or equal to a weight of Connection **853** pointing to that Knowledge Cell **800**. Similarity index can be set to be more, less, or equally important than a weight of a Connection **853**.

In other embodiments, Decision-making Unit **540** can utilize Connections **853** in selecting Knowledge Cells **800** or elements (i.e. Digital Pictures **525**, Instruction Sets **526**, etc.) thereof in a path through Neural Network **530***a*. In some aspects, Decision-making Unit **540** can take into account weights of Connections **853** among the interconnected Knowledge Cells **800** in choosing from which Knowledge Cell **800** to compare one or more Digital Pictures **525** first, second, third, and so on. Specifically, for instance, Decision-making Unit **540** can perform Similarity Comparison **125** with one or more Digital Pictures **525** from Knowledge Cell **800** pointed to by the highest weight Connection **853** first, Digital Pictures **525** from Knowledge Cell **800** pointed to by the second highest weight Connection **853** second, and so on. In other aspects, Decision-making Unit **540** can stop performing Similarity Comparisons **125** as soon as it finds one or more substantially similar Digital Pictures **525** in an interconnected Knowledge Cell **800**. In further aspects, Decision-making Unit **540** may only follow the highest weight Connection **853** to arrive at a Knowledge Cell **800** comprising one or more Digital Pictures **525** to be compared, thereby disregarding Connections **853** with less than the highest weight. In further aspects, Decision-making Unit **540** may ignore Connections **853** and/or their weights.

In further embodiments, Decision-making Unit **540** can utilize a bias to adjust similarity index, weight of a Connection **853**, and/or other element or parameter used in selecting Knowledge Cells **800** or elements (i.e. Digital Pictures **525**, Instruction Sets **526**, etc.) thereof in a path through Neural Network **530***a*. In one example, Decision-making Unit **540** may select a Knowledge Cell **800** comprising one or more Digital Pictures **525** whose similarity index multiplied by or adjusted for a bias is higher than or equal to a weight of Connection **853** pointing to that Knowledge Cell **800**. In another example, Decision-making Unit **540** may select a Knowledge Cell **800** comprising one or more Digital Pictures **525** whose similarity index multiplied by or adjusted for a bias is lower than or equal to a weight of Connection **853** pointing to that Knowledge Cell **800**. In a further example, bias can be used to resolve deadlock situations where similarity index is equal to a weight of a Connection **853**. In some aspects, bias can be expressed in percentages such as 0.3 percent, 1.2 percent, 25.7 percent, 79.8 percent, 99.9 percent, 100.1 percent, 155.4 percent, 298.6 percent, 1105.5 percent, and so on. For example, a bias below 100 percent decreases an element or parameter to which it is applied, a bias equal to 100 percent does not change the element or parameter to which it is applied, and a bias higher than 100 percent increases the element or parameter to which it is applied. In general, any amount of bias can be utilized. Bias can be applied to one or more of a weight of a Connection **853**, similarity index, any other element or parameter, and/or all or any combination of them. Also, different biases can be applied to each of a weight of a Connection **853**, similarity index, or any other element or parameter. For example, 30 percent bias can be applied to similarity index and 15 percent bias can be applied to a weight of a Connection **853**. Also, different biases can be applied to various Layers **854** of Neural Network **530***a*, and/or other disclosed elements. Bias can be defined by a user, by VSADO system administrator, or automatically by the system based on experience, testing, inquiry, analysis, synthesis, or other techniques, knowledge, or input.

Any other element and/or technique can be utilized in selecting Knowledge Cells **800** or elements (i.e. Digital Pictures **525**, Instruction Sets **526**, etc.) thereof in a path through Neural Network **530***a*.

In some embodiments, Neural Network **530***a* may include knowledge (i.e. interconnected Knowledge Cells **800** comprising one or more Digital Pictures **525** correlated with any Instruction Sets **526** and/or Extra Info **527**, etc.) of how Device **98** operated in various visual surroundings. In some aspects, determining anticipatory Instruction Sets **526** using Neural Network **530***a* may include selecting a path of Knowledge Cells **800** or elements (i.e. Digital Pictures **525**, Instruction Sets **526**, etc.) thereof through Neural Network **530***a*. Individual and/or collective Similarity Comparisons **125** can be used to determine substantial similarity of the individually and/or collectively compared Digital Pictures **525** or portions thereof. Substantial similarity may be used primarily for selecting a path through Neural Network **530***a*, whereas, weight of any Connection **853** may be used secondarily or not at all.

For example, Decision-making Unit **540** can perform Similarity Comparisons **125** of Digital Pictures **525***a***1**-**525***an* or portions thereof from Picture Capturing Apparatus **90** with Digital Pictures **525** or portions thereof from one or more Knowledge Cells **800** in Layer **854***a* (or any other one or more Layers **854**, etc.). Digital Pictures **525** or portions thereof from Knowledge Cell **800***ta* may be found collectively substantially similar with highest similarity. As the comparisons of individual Digital Pictures **525** are performed to determine collective similarity, Decision-making Unit **540** can anticipate Instruction Sets **526** correlated with substantially similar individual Digital Pictures **525** as previously described, thereby enabling autonomous Device **98** operation. Decision-making Unit **540** can then perform Similarity Comparisons **125** of Digital Pictures **525***b***1**-**525***bn* or portions thereof from Picture Capturing Apparatus **90** with Digital Pictures **525** or portions thereof from one or more Knowledge Cells **800** in Layer **854***b* interconnected with Knowledge Cell **800***ta*. Digital Pictures **525** or portions thereof from Knowledge Cell **800***tb* may be found collectively substantially similar with highest similarity, thus, Decision-making Unit **540** may follow Connection **853***t***1** disregarding its less than highest weight. As the comparisons of individual Digital Pictures **525** are performed to determine collective similarity, Decision-making Unit **540** can

anticipate Instruction Sets **526** correlated with substantially similar individual Digital Pictures **525** as previously described, thereby enabling autonomous Device **98** operation. Since Connection **853***t***2** is the only connection from Knowledge Cell **800***tb*, Decision-making Unit **540** may follow Connection **853***t***2** and perform Similarity Comparisons **125** of Digital Pictures **525***c***1-525***cn* or portions thereof from Picture Capturing Apparatus **90** with Digital Pictures **525** or portions thereof from Knowledge Cell **800***tc* in Layer **854***c*. Digital Pictures **525** or portions thereof from Knowledge Cell **800***tc* may be found collectively substantially similar. As the comparisons of individual Digital Pictures **525** are performed to determine collective similarity, Decision-making Unit **540** can anticipate Instruction Sets **526** correlated with substantially similar individual Digital Pictures **525** as previously described, thereby enabling autonomous Device **98** operation. Decision-making Unit **540** can then perform Similarity Comparisons **125** of Digital Pictures **525***d***1-525***dn* or portions thereof from Picture Capturing Apparatus **90** with Digital Pictures **525** or portions thereof from one or more Knowledge Cells **800** in Layer **854***d* interconnected with Knowledge Cell **800***tc*. Digital Pictures **525** or portions thereof from Knowledge Cell **800***td* may be found collectively substantially similar with highest similarity, thus, Decision-making Unit **540** may follow Connection **853***t***3**. As the comparisons of individual Digital Pictures **525** are performed to determine collective similarity, Decision-making Unit **540** can anticipate Instruction Sets **526** correlated with substantially similar individual Digital Pictures **525** as previously described, thereby enabling autonomous Device **98** operation. Decision-making Unit **540** can then perform Similarity Comparisons **125** of Digital Pictures **525***e***1-525***en* or portions thereof from Picture Capturing Apparatus **90** with Digital Pictures **525** or portions thereof from one or more Knowledge Cells **800** in Layer **854***e* interconnected with Knowledge Cell **800***td*. Digital Pictures **525** or portions thereof from Knowledge Cell **800***te* may be found collectively substantially similar with highest similarity, thus, Decision-making Unit **540** may follow Connection **853***t***4**. As the comparisons of individual Digital Pictures **525** are performed to determine collective similarity, Decision-making Unit **540** can anticipate Instruction Sets **526** correlated with substantially similar individual Digital Pictures **525** as previously described, thereby enabling autonomous Device **98** operation. Decision-making Unit **540** can implement similar logic or process for any additional Digital Pictures **525** from Picture Capturing Apparatus **90**, and so on.

The foregoing exemplary embodiment provides an example of utilizing a combination of collective Similarity Comparisons **125**, individual Similarity Comparisons **125**, Connections **853**, and/or other elements or techniques. It should be understood that any of these elements and/or techniques can be omitted, used in a different combination, or used in combination with other elements and/or techniques, in which case the selection of Knowledge Cells **800** or elements (i.e. Digital Pictures **525**, Instruction Sets **526**, etc.) thereof in a path through Neural Network **530***a* would be affected accordingly. Any of the elements and/or techniques utilized in other examples or embodiments described herein such as using Extra Info **527** in Similarity Comparisons **125**, traversing of Knowledge Cells **800** or other elements, using history of Digital Pictures **525** or Knowledge Cells **800** for collective Similarity Comparisons **125**, using various arrangements of Digital Pictures **525** and/or other elements in a Knowledge Cell **800**, and/or others can similarly be utilized in this example. These elements and/or techniques can similarly be utilized in Graph **530***b*, Collection of Sequences **530***c*, Sequence **533**, Collection of Knowledge Cells **530***d*, and/or other data structures or arrangements. In some aspects, instead of anticipating Instruction Sets **526** correlated with substantially similar individual Digital Pictures **525**, Decision-making Unit **540** can anticipate instruction Sets **526** correlated with substantially similar streams of Digital Pictures **525**. In other aspects, any time that substantial similarity or other similarity threshold is not achieved in compared Digital Pictures **525** or portions thereof of any of the Knowledge Cells **800**, Decision-making Unit **540** can decide to look for a substantially or otherwise similar Digital Pictures **525** or portions thereof in Knowledge Cells **800** elsewhere in Neural Network **530***a* such as in any Layer **854** subsequent to a current Layer **854**, in the first Layer **854**, in the entire Neural Network **530***a*, and/or others, even if such Knowledge Cell **800** may be unconnected with a prior Knowledge Cell **800**. It should be noted that any of Digital Pictures **525***a***1-525***an*, Digital Pictures **525***b***1-525***bn*, Digital Pictures **525***c***1-525***cn*, Digital Pictures **525***d***1-525***dn*, Digital Pictures **525***e***1-525***en*, etc. may include one Digital Picture **525** or a stream of Digital Pictures **525**. It should also be noted that any Knowledge Cell **800** may include one Digital Picture **525** or a stream of Digital Pictures **525** as previously described. One of ordinary skill in art will understand that the foregoing exemplary embodiment is described merely as an example of a variety of possible implementations, and that while all of its variations are too voluminous to describe, they are within the scope of this disclosure.

Referring to FIG. **27**, an embodiment of determining anticipatory Instruction Sets **526** using Graph **530***b* is illustrated. Graph **530***b* may include knowledge (i.e. interconnected Knowledge Cells **800** comprising one or more Digital Pictures **525** correlated with any Instruction Sets **526** and/or Extra Info **527**, etc.) of how Device **98** operated in various visual surroundings. In some aspects, determining anticipatory Instruction Sets **526** using Graph **530***b* may include selecting a path of Knowledge Cells **800** or elements (i.e. Digital Pictures **525**, Instruction Sets **526**, etc.) thereof through Graph **530***b*. Individual and/or collective Similarity Comparisons **125** can be used to determine substantial similarity of the individually and/or collectively compared Digital Pictures **525** or portions thereof. Substantial similarity may be used primarily for selecting a path through Graph **530***b*, whereas, weight of any Connection **853** may be used secondarily or not at all.

For example, Decision-making Unit **540** can perform Similarity Comparisons **125** of Digital Pictures **525***a***1-525***an* or portions thereof from Picture Capturing Apparatus **90** with Digital Pictures **525** or portions thereof from one or more Knowledge Cells **800** in Graph **530***b*. Digital Pictures **525** or portions thereof from Knowledge Cell **800***ua* may be found collectively substantially similar with highest similarity. As the comparisons of individual Digital Pictures **525** are performed to determine collective similarity, Decision-making Unit **540** can anticipate Instruction Sets **526** correlated with substantially similar individual Digital Pictures **525** as previously described, thereby enabling autonomous Device **98** operation. Decision-making Unit **540** can then perform Similarity Comparisons **125** of Digital Pictures **525***b***1-525***bn* or portions thereof from Picture Capturing Apparatus **90** with Digital Pictures **525** or portions thereof from one or more Knowledge Cells **800** in Graph **530***b* interconnected with Knowledge Cell **800***ua* by outgoing Connections **853**. Digital Pictures **525** or portions thereof from Knowledge Cell **800***ub* may be found collectively

substantially similar with highest similarity, thus, Decision-making Unit **540** may follow Connection **853***u***1** disregarding its less than highest weight. As the comparisons of individual Digital Pictures **525** are performed to determine collective similarity, Decision-making Unit **540** can anticipate Instruction Sets **526** correlated with substantially similar individual Digital Pictures **525** as previously described, thereby enabling autonomous Device **98** operation. Decision-making Unit **540** can then perform Similarity Comparisons **125** of Digital Pictures **525***c***1-525***cn* or portions thereof from Picture Capturing Apparatus **90** with Digital Pictures **525** or portions thereof from one or more Knowledge Cells **800** in Graph **530***b* interconnected with Knowledge Cell **800***ub* by outgoing Connections **853**. Digital Pictures **525** or portions thereof from Knowledge Cell **800***uc* may be found collectively substantially similar with highest similarity, thus, Decision-making Unit **540** may follow Connection **853***u***2** disregarding its less than highest weight. As the comparisons of individual Digital Pictures **525** are performed to determine collective similarity, Decision-making Unit **540** can anticipate Instruction Sets **526** correlated with substantially similar individual Digital Pictures **525** as previously described, thereby enabling autonomous Device **98** operation. Since Connection **853***u***3** is the only connection from Knowledge Cell **800***uc*, Decision-making Unit **540** may follow Connection **853***u***3** and perform Similarity Comparisons **125** of Digital Pictures **525***d***1-525***dn* or portions thereof from Picture Capturing Apparatus **90** with Digital Pictures **525** or portions thereof from Knowledge Cell **800***ud* in Graph **530***b*. Digital Pictures **525** or portions thereof from Knowledge Cell **800***ud* may be found collectively substantially similar. As the comparisons of individual Digital Pictures **525** are performed to determine collective similarity, Decision-making Unit **540** can anticipate Instruction Sets **526** correlated with substantially similar individual Digital Pictures **525** as previously described, thereby enabling autonomous Device **98** operation. Decision-making Unit **540** can then perform Similarity Comparisons **125** of Digital Pictures **525***e***1-525***en* or portions thereof from Picture Capturing Apparatus **90** with Digital Pictures **525** or portions thereof from one or more Knowledge Cells **800** in Graph **530***b* interconnected with Knowledge Cell **800***ud* by outgoing Connections **853**. Digital Pictures **525** or portions thereof from Knowledge Cell **800***ue* may be found collectively substantially similar with highest similarity, thus, Decision-making Unit **540** may follow Connection **853***u***4**. As the comparisons of individual Digital Pictures **525** are performed to determine collective similarity, Decision-making Unit **540** can anticipate Instruction Sets **526** correlated with substantially similar individual Digital Pictures **525** as previously described, thereby enabling autonomous Device **98** operation. Decision-making Unit **540** can implement similar logic or process for any additional Digital Pictures **525** from Activity Detector **160**, and so on.

The foregoing exemplary embodiment provides an example of utilizing a combination of collective Similarity Comparisons **125**, individual Similarity Comparisons **125**, Connections **853**, and/or other elements or techniques. It should be understood that any of these elements and/or techniques can be omitted, used in a different combination, or used in combination with other elements and/or techniques, in which case the selection of Knowledge Cells **800** or elements (i.e. Digital Pictures **525**, Instruction Sets **526**, etc.) thereof in a path through Graph **530***b* would be affected accordingly. Any of the elements and/or techniques utilized in other examples or embodiments described herein such as using Extra Info **527** in Similarity Comparisons **125**, traversing of Knowledge Cells **800** or other elements, using history of Digital Pictures **525** or Knowledge Cells **800** in collective Similarity Comparisons **125**, using various arrangements of Digital Pictures **525** and/or other elements in a Knowledge Cell **800**, and/or others can similarly be utilized in this example. These elements and/or techniques can similarly be utilized in Neural Network **530***a*, Collection of Sequences **530***c*, Sequence **533**, Collection of Knowledge Cells **530***d*, and/or other data structures or arrangements. In some aspects, instead of anticipating Instruction Sets **526** correlated with substantially similar individual Digital Pictures **525**, Decision-making Unit **540** can anticipate instruction Sets **526** correlated with substantially matching streams of Digital Pictures **525**. In other aspects, any time that substantial similarity or other similarity threshold is not achieved in compared Digital Pictures **525** or portions thereof of any of the Knowledge Cells **800**, Decision-making Unit **540** can decide to look for a substantially or otherwise similar Digital Pictures **525** or portions thereof in Knowledge Cells **800** elsewhere in Graph **530***b* even if such Knowledge Cell **800** may be unconnected with a prior Knowledge Cell **800**. It should be noted that any of Digital Pictures **525***a***1-525***an*, Digital Pictures **525***b***1-525***bn*, Digital Pictures **525***c***1-525***cn*, Digital Pictures **525***d***1-525***dn*, Digital Pictures **525***e***1-525***en*, etc. may include one Digital Picture **525** or a stream of Digital Pictures **525**. It should also be noted that any Knowledge Cell **800** may include one Digital Picture **525** or a stream of Digital Pictures **525** as previously described. One of ordinary skill in art will understand that the foregoing exemplary embodiment is described merely as an example of a variety of possible implementations, and that while all of its variations are too voluminous to describe, they are within the scope of this disclosure.

Referring to FIG. **28**, an embodiment of determining anticipatory Instruction Sets **526** using Collection of Sequences **530***c* is illustrated. Collection of Sequences **530***c* may include knowledge (i.e. sequences of Knowledge Cells **800** comprising one or more Digital Pictures **525** correlated with any Instruction Sets **526** and/or Extra Info **527**, etc.) of how Device **98** operated in various visual surroundings. In some aspects, determining anticipatory Instruction Sets **526** for autonomous Device **98** operation using Collection of Sequences **530***c* may include selecting a Sequence **533** of Knowledge Cells **800** or elements (i.e. Digital Pictures **525**, Instruction Sets **526**, etc.) thereof from Collection of Sequences **530***c*. Individual and/or collective Similarity Comparisons **125** can be used to determine substantial similarity of the individually and/or collectively compared Digital Pictures **525** or portions thereof.

For example, Decision-making Unit **540** can perform Similarity Comparisons **125** of Digital Pictures **525***a***1-525***an* or portions thereof from Picture Capturing Apparatus **90** with Digital Pictures **525** or portions thereof from corresponding Knowledge Cells **800** in one or more Sequences **533** of Collection of Sequences **530***c*. Digital Pictures **525** or portions thereof from Knowledge Cell **800***ca* in Sequence **533***wc* may be found collectively substantially similar with highest similarity. As the comparisons of individual Digital Pictures **525** are performed to determine collective similarity, Decision-making Unit **540** can anticipate Instruction Sets **526** correlated with substantially similar individual Digital Pictures **525** as previously described, thereby enabling autonomous Device **98** operation. Decision-making Unit **540** can then perform Similarity Comparisons **125** of Digital Pictures **525***a***1-525***an* and **525***b***1-525***bn* or portions thereof from Picture Capturing Apparatus **90** with

Digital Pictures **525** or portions thereof from corresponding Knowledge Cells **800** in Sequences **533** of Collection of Sequences **530***c*. Digital Pictures **525** or portions thereof from Knowledge Cells **800***ca*-**800***cb* in Sequence **533***wc* may be found collectively substantially similar with highest similarity. As the comparisons of individual Digital Pictures **525** are performed to determine collective similarity, Decision-making Unit **540** can anticipate Instruction Sets **526** correlated with substantially similar individual Digital Pictures **525** as previously described, thereby enabling autonomous Device **98** operation. Decision-making Unit **540** can then perform Similarity Comparisons **125** of Digital Pictures **525***a***1**-**525***an*, **525***b***1**-**525***bn*, and **525***c***1**-**525***cn* or portions thereof from Picture Capturing Apparatus **90** with Digital Pictures **525** or portions thereof from corresponding Knowledge Cells **800** in Sequences **533** of Collection of Sequences **530***c*. Digital Pictures **525** or portions thereof from Knowledge Cells **800***da*-**800***dc* in Sequence **533***wd* may be found substantially similar with highest similarity. As the comparisons of individual Digital Pictures **525** are performed to determine collective similarity, Decision-making Unit **540** can anticipate Instruction Sets **526** correlated with substantially similar individual Digital Pictures **525** as previously described, thereby enabling autonomous Device **98** operation. Decision-making Unit **540** can then perform Similarity Comparisons **125** of Digital Pictures **525***a***1**-**525***an*, **525***b***1**-**525***bn*, **525***c***1**-**525***cn*, and **525***d***1**-**525***dn* or portions thereof from Picture Capturing Apparatus **90** with Digital Pictures **525** or portions thereof from corresponding Knowledge Cells **800** in Sequences **533** of Collection of Sequences **530***c*. Digital Pictures **525** or portions thereof from Knowledge Cells **800***da*-**800***dd* in Sequence **533***wd* may be found substantially similar with highest similarity. As the comparisons of individual Digital Pictures **525** are performed to determine collective similarity, Decision-making Unit **540** can anticipate Instruction Sets **526** correlated with substantially similar individual Digital Pictures **525** as previously described, thereby enabling autonomous Device **98** operation. Decision-making Unit **540** can then perform Similarity Comparisons **125** of Digital Pictures **525***a***1**-**525***an*, **525***b***1**-**525***bn*, **525***c***1**-**525***cn*, **525***d***1**-**525***dn*, and **525***e***1**-**525***en* or portions thereof from Picture Capturing Apparatus **90** with Digital Pictures **525** or portions thereof from corresponding Knowledge Cells **800** in Sequences **533** of Collection of Sequences **530***c*. Digital Pictures **525** or portions thereof from Knowledge Cells **800***da*-**800***de* in Sequence **533***wd* may be found substantially similar with highest similarity. As the comparisons of individual Digital Pictures **525** are performed to determine collective similarity, Decision-making Unit **540** can anticipate Instruction Sets **526** correlated with substantially similar individual Digital Pictures **525** as previously described, thereby enabling autonomous Device **98** operation. Decision-making Unit **540** can implement similar logic or process for any additional Digital Pictures **525** from Picture Capturing Apparatus **90**, and so on.

In some embodiments, various elements and/or techniques can be utilized in the aforementioned substantial similarity determinations with respect to collectively compared Knowledge Cells **800** or elements (i.e. Digital Pictures **525**, Extra Info **527**, etc.) thereof. In some aspects, substantial similarity of collectively compared Knowledge Cells **800** or elements (i.e. Digital Pictures **525**, Extra Info **527**, etc.) thereof can be determined based on similarities or similarity indexes of the individually compared Knowledge Cells **800** or elements (i.e. Digital Pictures **525**, Extra Info **527**, etc.) thereof. In one example, an average of similarities or similarity indexes of individually compared Knowledge Cells **800** or elements (i.e. Digital Pictures **525**, Extra Info **527**, etc.) thereof can be used to determine similarity of collectively compared Knowledge Cells **800** or elements (i.e. Digital Pictures **525**, Extra Info **527**, etc.) thereof. In another example, a weighted average of similarities or similarity indexes of individually compared Knowledge Cells **800** or elements (i.e. Digital Pictures **525**, Extra Info **527**, etc.) thereof can be used to determine similarity of collectively compared Knowledge Cells **800** or elements (i.e. Digital Pictures **525**, Extra Info **527**, etc.) thereof. For instance, to affect the weighting of collective similarity, a higher weight or importance (i.e. importance index, etc.) can be assigned to the similarities or similarity indexes of some Knowledge Cells **800** or elements (i.e. Digital Pictures **525**, Extra Info **527**, etc.) thereof and lower for other Knowledge Cells **800** or elements (i.e. Digital Pictures **525**, Extra Info **527**, etc.) thereof. Any higher or lower weight or importance assignment can be implemented. In other aspects, any of the previously described or other thresholds for substantial similarity of individually compared elements can similarly be utilized for collectively compared elements. In one example, substantial similarity of collectively compared Knowledge Cells **800** or elements (i.e. Digital Pictures **525**, Extra Info **527**, etc.) thereof can be achieved when their collective similarity or similarity index exceeds a similarity threshold. In another example, substantial similarity of collectively compared Knowledge Cells **800** can be achieved when at least a threshold number or percentage of Digital Pictures **525** or portions thereof of the collectively compared Knowledge Cells **800** match or substantially match. Similarly, substantial similarity of collectively compared Knowledge Cells **800** can be achieved when a number or percentage of matching or substantially matching Digital Pictures **525** or portions thereof of the collectively compared Knowledge Cells **800** exceeds a threshold. Such thresholds can be defined by a user, by VSADO system administrator, or automatically by the system based on experience, testing, inquiry, analysis, synthesis, or other techniques, knowledge, or input. Collective similarity determinations may include any features, functionalities, and embodiments of Similarity Comparison **125**, and vice versa.

The foregoing exemplary embodiment provides an example of utilizing a combination of collective Similarity Comparisons **125**, individual Similarity Comparisons **125**, and/or other elements or techniques. It should be understood that any of these elements and/or techniques can be omitted, used in a different combination, or used in combination with other elements and/or techniques, in which case the selection of Sequence **533** of Knowledge Cells **800** or elements (i.e. Digital Pictures **525**, Instruction Sets **526**, etc.) thereof would be affected accordingly. Any of the elements and/or techniques utilized in other examples or embodiments described herein such as using Extra Info **527** in Similarity Comparisons **125**, traversing of Knowledge Cells **800** or other elements, using history of Digital Pictures **525** or Knowledge Cells **800** in collective Similarity Comparisons **125**, using various arrangements of Digital Pictures **525** and/or other elements in a Knowledge Cell **800**, and/or others can similarly be utilized in this example. These elements and/or techniques can similarly be utilized in Neural Network **530***a*, Graph **530***b*, Collection of Knowledge Cells **530***d*, and/or other data structures or arrangements. In some aspects, instead of anticipating Instruction Sets **526** correlated with substantially similar individual Digital Pictures **525**, Decision-making Unit **540** can anticipate Instruction Sets **526** correlated with substantially matching streams of Digital Pictures **525**. In other aspects,

any time that substantial similarity or other similarity threshold is not achieved in compared Digital Pictures **525** or portions thereof of any of the Knowledge Cells **800**, Decision-making Unit **540** can decide to look for a substantially or otherwise similar Digital Pictures **525** or portions thereof in Knowledge Cells **800** elsewhere in Collection of Sequences **530***c* such as in different Sequences **533**. It should be noted that any of Digital Pictures **525***a***1-525***an*, Digital Pictures **525***b***1-525***bn*, Digital Pictures **525***c***1-525***cn*, Digital Pictures **525***d***1-525***dn*, Digital Pictures **525***e***1-525***en*, etc. may include one Digital Picture **525** or a stream of Digital Pictures **525**. It should also be noted that any Knowledge Cell **800** may include one Digital Picture **525** or a stream of Digital Pictures **525** as previously described. One of ordinary skill in art will understand that the foregoing exemplary embodiment is described merely as an example of a variety of possible implementations, and that while all of its variations are too voluminous to describe, they are within the scope of this disclosure.

Referring now to Modification Interface **130**. Modification Interface **130** comprises the functionality for modifying execution and/or functionality of Application Program **18**, Processor **11**, Logic Circuit **250**, and/or other processing element. Modification Interface **130** comprises the functionality for modifying execution and/or functionality of Application Program **18**, Processor **11**, Logic Circuit **250**, and/or other processing element at runtime. Modification Interface **130** comprises the functionality for modifying execution and/or functionality of Application Program **18**, Processor **11**, Logic Circuit **250**, and/or other processing element based on anticipatory Instruction Sets **526**. In one example, Modification Interface **130** comprises the functionality to access, modify, and/or perform other manipulations on runtime engine/environment, virtual machine, operating system, compiler, just-in-time (JIT) compiler, interpreter, translator, execution stack, file, object, data structure, and/or other computing system elements. In another example, Modification Interface **130** comprises the functionality to access, modify, and/or perform other manipulations on memory, storage, bus, interfaces, and/or other computing system elements. In a further example, Modification Interface **130** comprises the functionality to access, modify, and/or perform other manipulations on Processor **11** registers and/or other Processor **11** elements. In a further example, Modification Interface **130** comprises the functionality to access, modify, and/or perform other manipulations on inputs and/or outputs of Application Program **18**, Processor **11**, Logic Circuit **250**, and/or other processing element. In a further example, Modification Interface **130** comprises the functionality to access, create, delete, modify, and/or perform other manipulations on functions, methods, procedures, routines, subroutines, and/or other elements of Application Program **18**. In a further example, Modification Interface **130** comprises the functionality to access, create, delete, modify, and/or perform other manipulations on source code, bytecode, compiled, interpreted, or otherwise translated code, machine code, and/or other code. In a further example, Modification Interface **130** comprises the functionality to access, create, delete, modify, and/or perform other manipulations on values, variables, parameters, and/or other data or information. Modification Interface **130** comprises any features, functionalities, and embodiments of Acquisition Interface **120**, and vice versa. Modification Interface **130** also comprises other disclosed functionalities.

Modification Interface **130** can employ various techniques for modifying execution and/or functionality of Application Program **18**, Processor **11**, Logic Circuit **250**, and/or other processing element. In some aspects, some of the previously described techniques and/or tools can be utilized. Code instrumentation, for instance, may involve inserting additional code, overwriting or rewriting existing code, and/or branching to a separate segment of code in Application Program **18** as previously described. For example, instrumented code may include the following:

```
Object1.moveLeft(12);
modifyApplication( );
```

In the above sample code, instrumented call to Modification Interface's **130** function (i.e. modifyApplication( ), etc.) can be placed after a function (i.e. moveLeft(12), etc.) of Application Program **18**. Similar call to an application modifying function can be placed after or before some or all functions/routines/subroutines, some or all lines of code, some or all statements, some or all instructions or instruction sets, some or all basic blocks, and/or some or all other code segments of Application Program **18**. One or more application modifying function calls can be placed anywhere in Application Program's **18** code and can be executed at any points in Application Program's **18** execution. The application modifying function (i.e. modifyApplication( ), etc.) may include Artificial Intelligence Unit **110**-determined anticipatory Instruction Sets **526** that can modify execution and/or functionality of Application Program **18**. In some embodiments, the previously described obtaining Application Program's **18** instruction sets, data, and/or other information as well as modifying execution and/or functionality of Application Program **18** can be implemented in a single function that performs both tasks (i.e. traceAndModifyApplication( ), etc.).

In some embodiments, various computing systems and/or platforms may provide native tools for modifying execution and/or functionality of Application Program **18**, Processor **11**, Logic Circuit **250**, and/or other processing element. Independent vendors may provide tools with similar functionalities that can be utilized across different platforms. These tools enable a wide range of techniques or capabilities such as instrumentation, self-modifying code capabilities, dynamic code capabilities, branching, code rewriting, code overwriting, hot swapping, accessing and/or modifying objects or data structures, accessing and/or modifying functions/routines/subroutines, accessing and/or modifying variable or parameter values, accessing and/or modifying processor registers, accessing and/or modifying inputs and/or outputs, providing runtime memory access, and/or other capabilities. One of ordinary skill in art will understand that, while all possible variations of the techniques for modifying execution and/or functionality of Application Program **18**, Processor **11**, Logic Circuit **250**, and/or other processing element are too voluminous to describe, these techniques are within the scope of this disclosure.

In one example, modifying execution and/or functionality of Application Program **18** can be implemented through utilizing metaprogramming techniques, which include applications that can self-modify or that can create, modify, and/or manipulate other applications. Self-modifying code, dynamic code, reflection, and/or other techniques can be used to facilitate metaprogramming. In some aspects, metaprogramming is facilitated through a programming language's ability to access and manipulate the internals of the runtime engine directly or via an API. In other aspects, metaprogramming is facilitated through dynamic execution of expressions (i.e. anticipatory Instruction Sets **526**, etc.) that can be created and/or executed at runtime. In yet other aspects, metaprogramming is facilitated through application modification tools, which can perform modifications on an

application regardless of whether the application's programming language enables metaprogramming capabilities. Some operating systems may protect an application loaded into memory by restricting access to the loaded application. This protection mechanism can be circumvented by utilizing operating system's, processor's, and/or other low level features or commands to unprotect the loaded application. For example, a self-modifying application may modify the in-memory image of itself. To do so, the application can obtain the in-memory address of its code. The application may then change the operating system's or platform's protection on this memory range allowing it to modify the code (i.e. insert anticipatory Instruction Sets **526**, etc.). In addition to a self-modifying application, one application can utilize similar technique to modify another application. Linux mprotect command or similar commends of other operating systems can be used to change protection (i.e. unprotect, etc.) for a region of memory, for example. Other platforms, tools, and/or techniques may provide equivalent or similar functionalities as the above described ones.

In a further example, modifying execution and/or functionality of Application Program **18** can be implemented through native capabilities of dynamic, interpreted, and/or scripting programming languages and/or platforms. Most of these languages and/or platforms can perform functionalities at runtime that static programming languages may perform during compilation. Dynamic, interpreted, and/or scripting languages provide native functionalities such as self-modification of code, dynamic code, extending the application, adding new code, extending objects and definitions, and/or other functionalities that can modify an application's execution and/or functionality at runtime. Examples of dynamic, interpreted, and/or scripting languages include Lisp, Perl, PHP, JavaScript, Ruby, Python, Smalltalk, Tcl, VBScript, and/or others. Similar functionalities can also be provided in languages such as Java, C, and/or others using reflection. Reflection includes the ability of an application to examine and modify the structure and behavior of the application at runtime. For example, JavaScript can modify its own code as it runs by utilizing Function object constructor as follows:

```
myFunc=new Function(arg1, arg2, argN, functionBody);
```

The sample code above causes a new function object to be created with the specified arguments and body. The body and/or arguments of the new function object may include new instruction sets (i.e. anticipatory Instruction Sets **526**, etc.). The new function can be invoked as any other function in the original code. In another example, JavaScript can utilize eval method that accepts a string of JavaScript statements (i.e. anticipatory Instruction Sets **526**, etc.) and execute them as if they were within the original code. An example of how eval method can be used to modify an application includes the following JavaScript code:

```
anticipatorylnstr='Object1.moveForward(32);';
if (anticipatorylnstr !=" " && anticipatoryInstr !=null)
{
eval(anticipatorylnstr);
}
```

In the sample code above, Artificial Intelligence Unit **110** may generate anticipatory Instruction Set **526** (i.e. 'Object1.moveForward(32)' for moving an object forward 32 units, etc.) and save it in anticipatorylnstr variable, which eval method can then execute. Lisp is another example of dynamic, interpreted, and/or scripting language that includes similar capabilities as previously described JavaScript. For example, Lisp's compile command can create a function at runtime, eval command may parse and evaluate an expression at runtime, and exec command may execute a given instruction set (i.e. string, etc.) at runtime. In another example, dynamic as well as some non-dynamic languages may provide macros, which combine code introspection and/or eval capabilities. In some aspects, macros can access inner workings of the compiler, interpreter, virtual machine, runtime environment/engine, and/or other components of the computing platform enabling the definition of language-like constructs and/or generation of a complete program or sections thereof. Other platforms, tools, and/or techniques may provide equivalent or similar functionalities as the above described ones.

In a further example, modifying execution and/or functionality of Application Program **18** can be implemented through dynamic code, dynamic class loading, reflection, and/or other native functionalities of a programming language or platform. In static applications or static programming, a class can be defined and/or loaded at compile time. Conversely, in dynamic applications or dynamic programming, a class can be loaded into a running environment at runtime. For example, Java Runtime Environment (JRE) may not require that all classes be loaded at compile time and class loading can occur when a class is first referenced at runtime. Dynamic class loading enables inclusion or injection of on-demand code and/or functionalities at runtime. System provided or custom class loaders may enable loading of classes into the running environment. Custom class loaders can be created to enable custom functionalities such as, for example, specifying a remote location from which a class can be loaded. In addition to dynamic loading of a pre-defined class, a class can also be created at runtime. In some aspects, a class source code can be created at runtime. A compiler such as javac, com.sun.tools.javac.Main, javax.tools, javax.tools.JavaCompiler, and/or other packages can then be utilized to compile the source code. Javac, com.sun.tools.javac.Main, javax.tools, javax.tools.JavaCompiler, and/or other packages may include an interface to invoke Java compiler from within a running application. A Java compiler may accept source code in a file, string, object (i.e. Java String, StringBuffer, CharSequence, etc.) and/or other source, and may generate Java bytecode (i.e. class file, etc.). Once compiled, a class loader can then load the compiled class into the running environment. In other aspects, a tool such as Javaassist (i.e. Java programming assistant) can be utilized to enable an application to create or modify a class at runtime. Javassist may include a Java library that provides functionalities to create and/or manipulate Java bytecode of an application as well as reflection capabilities. Javassist may provide source-level and bytecode-level APIs. Using the source-level API, a class can be created and/or modified using only source code, which Javassist may compile seamlessly on the fly. Javassist source-level API can therefore be used without knowledge of Java bytecode specification. Bytecode-level API enables creating and/or editing a class bytecode directly. In yet other aspects, similar functionalities to the aforementioned ones may be provided in tools such as Apache Commons BCEL (Byte Code Engineering Library), ObjectWeb ASM, CGLIB (Byte Code Generation Library), and/or others. Once a dynamic code or class is created and loaded, reflection in high-level programming languages such as Java and/or others can be used to manipulate or change the runtime behavior of an application. Examples of reflective programming languages and/or platforms include Java, JavaScript, Smalltalk, Lisp, Python, .NET Common Language Runtime (CLR), Tcl, Ruby, Perl, PHP, Scheme, PL/SQL, and/or others. Reflection can be used in an application to access, examine, modify, and/or manipulate a loaded class and/or its

elements. Reflection in Java can be implemented by utilizing a reflection API such as java.lang.Reflect package. The reflection API provides functionalities such as, for example, loading or reloading a class, instantiating a new instance of a class, determining class and instance methods, invoking class and instance methods, accessing and manipulating a class, fields, methods and constructors, determining the modifiers for fields, methods, classes, and interfaces, and/or other functionalities. The above described dynamic code, dynamic class loading, reflection, and/or other functionalities are similarly provided in the .NET platform through its tools such as, for example, System.CodeDom.Compiler namespace, System.Reflection.Emit namespace, and/or other native or other .NET tools. Other platforms in addition to Java and .NET may provide similar tools and/or functionalities. In some designs, dynamic code, dynamic class loading, reflection, and/or other functionalities can be used to facilitate modification of an application by inserting or injecting instruction sets (i.e. anticipatory Instruction Sets **526**, etc.) into a running application. For example, an existing or dynamically created class comprising VSADO Unit **100** functionalities can be loaded into a running application through manual, automatic, or dynamic instrumentation. Once the class is created and loaded, an instance of VSADO Unit **100** class may be constructed. The instance of VSADO Unit **100** can then take or exert control of the application and/or implement alternate instruction sets (i.e. anticipatory Instruction Sets **526**, etc.) at any point in the application's execution. Other platforms, tools, and/or techniques may provide equivalent or similar functionalities as the above described ones.

In a further example, modifying execution and/or functionality of Application Program **18** can be implemented through independent tools that can be utilized across different platforms. Such tools provide instrumentation and/or other capabilities on more than one platform or computing system and may facilitate application modification or insertion of instruction sets (i.e. anticipatory Instruction Sets **526**, etc.). Examples of these tools include Pin, DynamoRIO, DynInst, Kprobes, KernInst, OpenPAT, DTrace, SystemTap, and/or others. In some aspects, Pin and/or any of its elements, methods, and/or techniques can be utilized for dynamic instrumentation. Pin can perform instrumentation by taking control of an application after it loads into memory. Pin may insert itself into the address space of an executing application enabling it to take control. Pin JIT compiler can then compile and implement alternate code (i.e. anticipatory Instruction Sets **526**, etc.). Pin provides an extensive API for instrumentation at several abstraction levels. Pin supports two modes of instrumentation, JIT mode and probe mode. JIT mode uses a just-in-time compiler to insert instrumentation and recompile program code while probe mode uses code trampolines for instrumentation. Pin was designed for architecture and operating system independence. In other aspects, KernInst and/or any of its elements, methods, and/or techniques can be utilized for dynamic instrumentation. KernInst includes an instrumentation framework designed for dynamically inserting code into a running kernel of an operating system. KernInst implements probe-based dynamic instrumentation where code can be inserted, changed, and/or removed at will. Kerninst API enables client tools to construct their own tools for dynamic kernel instrumentation to suit variety of purposes such as insertion of alternate instruction sets (i.e. anticipatory Instruction Sets **526**, etc.). Client tools can communicate with KernInst over a network (i.e. internet, wireless network, LAW, WAN, etc). Other platforms, tools, and/or techniques may provide equivalent or similar functionalities as the above described ones.

In a further example, modifying execution and/or functionality of Application Program **18** can be implemented through utilizing operating system's native tools or capabilities such as Unix ptrace command. Ptrace includes a system call that may enable one process to control another allowing the controller to inspect and manipulate the internal state of its target. Ptrace can be used to modify a running application such as modifying an application with alternate instruction sets (i.e. anticipatory Instruction Sets **526**, etc.). By attaching to an application using the ptrace call, the controlling application can gain extensive control over the operation of its target. This may include manipulation of its instruction sets, execution path, file descriptors, memory, registers, and/or other components. Ptrace can single-step through the target's code, observe and intercept system calls and their results, manipulate the target's signal handlers, receive and send signals on the target's behalf, and/or perform other operations within the target application. Ptrace's ability to write into the target application's memory space enables the controller to modify the running code of the target application. Other platforms, tools, and/or techniques may provide equivalent or similar functionalities as the above described ones.

In a further example, modifying execution and/or functionality of Application Program **18** can be implemented through utilizing just-in-time (JIT) compiling. JIT compilation (also known as dynamic translation, dynamic compilation, etc.) includes compilation performed during an application's execution (i.e. runtime, etc.). A code can be compiled when it is about to be executed, and it may be cached and reused later without the need for additional compilation. In some aspects, a JIT compiler can convert source code or byte code into machine code. In other aspects, a JIT compiler can convert source code into byte code. JIT compiling may be performed directly in memory. For example, JIT compiler can output machine code directly into memory and immediately execute it. Platforms such as Java, .NET, and/or others may implement JIT compilation as their native functionality. Platform independent tools for custom system design may include JIT compilation functionalities as well. In some aspects, JIT compilation includes redirecting application's execution to a JIT compiler from a specific entry point. For example, Pin can insert its JIT compiler into the address space of an application. Once execution is redirected to it, JIT compiler may receive alternate instruction sets (i.e. anticipatory Instruction Sets **526**, etc.) immediately before their compilation. The JIT compiled instruction sets can be stored in memory or another repository from where they may be retrieved and executed. Alternatively, for example, JIT compiler can create a copy of the original application code or a segment thereof, and insert alternate code (i.e. anticipatory Instruction Sets **526**, etc.) before compiling the modified code copy. In some aspects, JIT compiler may include a specialized memory such as fast cache memory dedicated to JIT compiler functionalities from which the modified code can be fetched rapidly. JIT compilation and/or any compilation in general may include compilation, interpretation, or other translation into machine code, bytecode, and/or other formats or types of code. Other platforms, tools, and/or techniques may provide equivalent or similar functionalities as the above described ones.

In a further example, modifying execution and/or functionality of Application Program **18** can be implemented through dynamic recompilation. Dynamic recompilation

includes recompiling an application or part thereof during execution. An application can be modified with alternate features or instruction sets that may take effect after recompilation. Dynamic recompilation may be practical in various types of applications including object oriented, event driven, forms based, and/or other applications. In a typical windows-based application, most of the action after initial startup occurs in response to user or system events such as moving the mouse, selecting a menu option, typing text, running a scheduled task, making a network connection, and/or other events when an event handler is called to perform an operation appropriate for the event. Generally, when no events are being generated, the application is idle. For example, when an event occurs and an appropriate event handler is called, instrumentation can be implemented in the application's source code to insert alternate instruction sets (i.e. anticipatory Instruction Sets **526**, etc.) at which point the modified source code can be recompiled and/or executed. In some aspects, the state of the application can be saved before recompiling its modified source code so that the application may continue from its prior state. Saving the application's state can be achieved by saving its variables, data structures, objects, location of its current instruction, and/or other necessary information in environmental variables, memory, or other repositories where they can be accessed once the application is recompiled. In other aspects, application's variables, data structures, objects, address of its current instruction, and/or other necessary information can be saved in a repository such as file, database, or other repository accessible to the application after recompilation of its source code. Other platforms, tools, and/or techniques may provide equivalent or similar functionalities as the above described ones.

In a further example, modifying execution and/or functionality of Application Program **18** can be implemented through modifying or redirecting Application Program's **18** execution path. Generally, an application can be loaded into memory and the flow of execution proceeds from one instruction set to the next until the end of the application. An application may include a branching mechanism that can be driven by keyboard or other input devices, system events, and/or other computing system components or events that may impact the execution path. The execution path can also be altered by an external application through acquiring control of execution and/or redirecting execution to a function, routine/subroutine, or an alternate code segment at any point in the application's execution. A branch, jump, or other mechanism can be utilized to implement the redirected execution. For example, a jump instruction can be inserted at a specific point in an application's execution to redirect execution to an alternate code segment. A jump instruction set may include, for example, an unconditional branch, which always results in branching, or a conditional branch, which may or may not result in branching depending on a condition. When executing an application, a computer may fetch and execute instruction sets in sequence until it encounters a branch instruction set. If the instruction set is an unconditional branch, or it is conditional and the condition is satisfied, the computer may fetch its next instruction set from a different instruction set sequence or code segment as specified by the branch instruction set. After the execution of the alternate code segment, control may be redirected back to the original jump point or to another point in the application. For example, modifying an application can be implemented by redirecting execution of an application to alternate instruction sets (i.e. anticipatory Instruction Sets **526**, etc.). Alternate instruction sets can be pre-compiled, pre-interpreted, or otherwise pre-translated and ready for execution. Alternate instruction sets can also be JIT compiled, JIT interpreted, or otherwise JIT translated before execution. Other platforms, tools, and/or techniques may provide equivalent or similar functionalities as the above described ones.

In a further example, modifying execution and/or functionality of Application Program **18** can be implemented through assembly language. Assembly language instructions may be directly related with the architecture's machine instructions as previously described. Assembly language can, therefore, be a powerful tool for implementing direct hardware (i.e. processor registers, memory, etc.) access and manipulations as well as access and manipulations of specialized processor features or instructions. Assembly language can also be a powerful tool for implementing low-level embedded systems, real-time systems, interrupt handlers, self or dynamically modifying code, and/or other applications. Specifically, for instance, self or dynamically modifying code that can be used to facilitate modifying of an application can be seamlessly implemented using assembly language. For example, using assembly language, instruction sets can be dynamically created and loaded into memory similar to the ones that a compiler may generate. Furthermore, using assembly language, memory space of a loaded application can be accessed to modify (including rewrite, overwrite, etc.) original instruction sets or to insert jumps or branches to alternate code elsewhere in memory. Some operating systems may implement protection from changes to applications loaded into memory. Operating system's, processor's, or other low level features or commands can be used to unprotect the protected locations in memory before the change as previously described. Alternatively, a pointer that may reside in a memory location where it could be readily altered can be utilized where the pointer may reference alternate code. In one example, assembly language can be utilized to write alternate code (i.e. anticipatory Instruction Sets **526**, etc.) into a location in memory outside a running application's memory space. Assembly language can then be utilized to redirect the application's execution to the alternate code by inserting a jump or branch into the application's in-memory code, by redirecting program counter, or by other technique. In another example, assembly language can be utilized to overwrite or rewrite the entire or part of an application's in-memory code with alternate code. In some aspects, high-level programming languages can call an external assembly language program to facilitate application modification as previously described. In yet other aspects, relatively low-level programming languages such as C may allow embedding assembly language directly in their source code such as, for example, using asm keyword of C. Other platforms, tools, and/or techniques may provide equivalent or similar functionalities as the above described ones.

In a further example, modifying execution and/or functionality of Application Program **18** can be implemented through binary rewriting. Binary rewriting tools and/or techniques may modify an application's executable. In some aspects, modification can be minor such as in the case of optimization where the original executable's functionality is kept. In other aspects, modification may change the application's functionality such as by inserting alternate code (i.e. anticipatory Instruction Sets **526**, etc.). Examples of binary rewriting tools include SecondWrite, ATOM, DynamoRIO, Purify, Pin, EEL, DynInst, PLTO, and/or others. Binary rewriting may include disassembly, analysis, and/or modification of target application. Since binary rewriting works

directly on machine code executable, it is independent of source language, compiler, virtual machine (if one is utilized), and/or other higher level abstraction layers. Also, binary rewriting tools can perform application modifications without access to original source code. Binary rewriting tools include static rewriters, dynamic rewriters, minimally-invasive rewriters, and/or others. Static binary rewriters can modify an executable when the executable is not in use (i.e. not running). The rewritten executable may then be executed including any new or modified functionality. Dynamic binary rewriters can modify an executable during its execution, thereby enabling modification of an application's functionality at runtime. In some aspects, dynamic rewriters can be used for instrumentation or selective modifications such as insertion of alternate code (i.e. anticipatory Instruction Sets **526**, etc.), and/or for other runtime transformations or modifications. For example, some dynamic rewriters can be configured to intercept an application's execution at indirect control transfers and insert instrumentation or other application modifying code. Minimally-invasive rewriters may keep the original machine code to the greatest extent possible. They support limited modifications such as insertion of jumps into and out of instrumented code. Other platforms, tools, and/or techniques may provide equivalent or similar functionalities as the above described ones.

Referring to FIG. **29**, in a further example, modifying execution and/or functionality of Processor **11** can be implemented through modification of processor registers, memory, or other computing system components. In some aspects, modifying execution and/or functionality of Processor **11** can be implemented by redirecting Processor's **11** execution to alternate instruction sets (i.e. anticipatory Instruction Sets **526**, etc.). In one example, Program Counter **211** may hold or point to a memory address of the next instruction set that will be executed by Processor **11**. Artificial Intelligence Unit **110** may generate anticipatory Instruction Sets **526** and store them in Memory **12** as previously described. Modification Interface **130** may then change Program Counter **211** to point to the location in Memory **12** where anticipatory Instruction Sets **526** are stored. The anticipatory Instruction Sets **526** can then be fetched from the location in Memory **12** pointed to by the modified Program Counter **211** and loaded into Instruction Register **212** for decoding and execution. Once anticipatory Instruction Sets **526** are executed, Modification Interface **130** may change Program Counter **211** to point to the last instruction set before the redirection or to any other instruction set. In other aspects, anticipatory Instruction Sets **526** can be loaded directly into Instruction Register **212**. As previously described, examples of other processor or computing system components that can be used during an instruction cycle include memory address register (MAR), memory data register (MDR), data registers, address registers, general purpose registers (GPRs), conditional registers, floating point registers (FPRs), constant registers, special purpose registers, machine-specific registers, Register Array **214**, Arithmetic Logic Unit **215**, control unit, and/or other circuits or components. Any of the aforementioned processor registers, memory, or other computing system components can be accessed and/or modified to facilitate the disclosed functionalities. In some embodiments, processor interrupt may be issued to facilitate such access and/or modification. In some designs, modifying execution and/or functionality of Processor **11** can be implemented in a program, combination of programs and hardware, or purely hardware system. Dedicated hardware may be built to perform modifying execution and/or functionality of Processor **11** with marginal or no impact to computing overhead. Other platforms, tools, and/or techniques may provide equivalent or similar functionalities as the above described ones.

Referring to FIGS. **30**A-**30**B, in a further example, modifying execution and/or functionality of Logic Circuit **250** can be implemented through modification of inputs and/or outputs of Logic Circuit **250**. While Processor **11** includes any type of logic circuit, Logic Circuit **250** is described separately herein to offer additional detail on its functioning. Logic Circuit **250** comprises the functionality for performing logic operations using the circuit's inputs and producing outputs based on the logic operations performed as previously described. In one example, Logic Circuit **250** may perform some logic operations using four input values and produce two output values. Modifying execution and/or functionality of Logic Circuit **250** can be implemented by replacing its input values with anticipatory input values (i.e. anticipatory Instruction Sets **526**, etc.). Artificial Intelligence Unit **110** may generate anticipatory input values as previously described. Modification Interface **130** can then transmit the anticipatory input values to Logic Circuit **250** through the four hardwired connections as shown in FIG. **30**A. Modification Interface **130** may use Switches **251** to prevent delivery of any input values that may be sent to Logic Circuit **250** from its usual input source. As such, VSADO Unit **100** may cause Logic Circuit **250** to perform its logic operations using the four anticipatory input values, thereby implementing autonomous Device **98** operation. In another example, Logic Circuit **250** may perform some logic operations using four input values and produce two output values. Modifying execution and/or functionality of Logic Circuit **250** can be implemented by replacing its output values with anticipatory output values (i.e. anticipatory Instruction Sets **526**, etc.). Artificial Intelligence Unit **110** may generate anticipatory output values (i.e. anticipatory Instruction Sets **526**, etc.) as previously described. Modification Interface **130** can then transmit the anticipatory output values through the two hardwired connections as shown in FIG. **30**B. Modification Interface **130** may use Switches **251** to prevent delivery of any output values that may be sent by Logic Circuit **250**. As such, VSADO Unit **100** may bypass Logic Circuit **250** and transmit the two anticipatory output values to downstream elements, thereby implementing autonomous Device **98** operation. In a further example, instead of or in addition to modifying input and/or output values of Logic Circuit **250**, the execution and/or functionality of Logic Circuit **250** may be modified by modifying values or signals in one or more Logic Circuit's **250** internal components such as registers, memories, buses, and/or others (i.e. similar to the previously described modifying of Processor **11** components, etc.). In some designs, modifying execution and/or functionality of Logic Circuit **250** can be implemented in a program, combination of programs and hardware, or purely hardware system. Dedicated hardware may be built to perform modifying execution and/or functionality of Logic Circuit **250** with marginal or no impact to computing overhead. Any of the elements and/or techniques for modifying execution and/or functionality of Logic Circuit **250** can similarly be implemented with Processor **11** and/or other processing elements.

In some embodiments, VSADO Unit **100** may directly modify the functionality of an actuator (previously described, not shown). For example, Logic Circuit **250** or other processing element may control an actuator that enables Device **98** to perform mechanical, physical, and/or other operations. An actuator may receive one or more input values or control signals from Logic Circuit **250** or other

processing element directing the actuator to perform specific operations. Modifying functionality of an actuator can be implemented by replacing its input values with anticipatory input values (i.e. anticipatory Instruction Sets **526**, etc.) as previously described with respect to replacing input values of Logic Circuit **250**. Specifically, for instance, Artificial Intelligence Unit **110** may generate anticipatory input values as previously described. Modification Interface **130** can then transmit the anticipatory input values to the actuator. Modification Interface **130** may use Switches **251** to prevent delivery of any input values that may be sent to the actuator from its usual input source. As such, VSADO Unit **100** may cause the actuator to perform its operations using the anticipatory input values, thereby implementing autonomous Device **98** operation.

One of ordinary skill in art will recognize that FIGS. **30**A-**30**B depict one of many implementations of Logic Circuit **250** and that any number of input and/or output values can be utilized in alternate implementations. One of ordinary skill in art will also recognize that Logic Circuit **250** may include any number and/or combination of logic components to implement any logic operations.

Other additional techniques or elements can be utilized as needed for modifying execution and/or functionality of Application Program **18**, Processor **11**, Logic Circuit **250**, and/or other processing elements, or some of the disclosed techniques or elements can be excluded, or a combination thereof can be utilized in alternate embodiments.

Referring to FIG. **31**, the illustration shows an embodiment of a method **6100** for learning and/or using visual surrounding for autonomous device operation. The method can be used on a computing device or system to enable learning of a device's operation in various visual surroundings and enable autonomous device operation in similar visual surroundings. Method **6100** may include any action or operation of any of the disclosed methods such as method **6200**, **6300**, **6400**, **6500**, **6600**, and/or others. Additional steps, actions, or operations can be included as needed, or some of the disclosed ones can be optionally omitted, or a different combination or order thereof can be implemented in alternate embodiments of method **6100**.

At step **6105**, a first digital picture is received. A digital picture (i.e. Digital Picture **525**, etc.) may include a depiction of a device's (i.e. Device's **98**, etc.) visual surrounding. A digital picture may include a depiction of a remote device's (i.e. Remote Device's **97**, etc.) visual surrounding. In some embodiments, a digital picture may include a collection of color encoded pixels or dots. A digital picture comprises any type or form of digital picture such as JPEG, GIF, TIFF, PNG, PDF, and/or other digitally encoded picture. In other embodiments, a stream of digital pictures (i.e. motion picture, video, etc.) may include one or more digital pictures. A stream of digital pictures comprises any type or form of digital motion picture such as MPEG, AVI, FLV, MOV, RM, SWF, WMV, DivX, and/or other digitally encoded motion picture. In some aspects, a digital picture may include or be substituted with a stream of digital pictures, and vice versa. Therefore, the terms digital picture and stream of digital pictures may be used interchangeably herein depending on context. One or more digital pictures can be captured by a picture capturing apparatus (i.e. Picture Capturing Apparatus **90**, etc.) such as a still or motion picture camera, or other picture capturing apparatus. In some aspects, a picture capturing apparatus may be part of a device whose visual surrounding is being used for VSADO functionalities. In other aspects, a picture capturing apparatus may be part of a remote device, accessible via a network, whose visual surrounding is being used for VSADO functionalities. Picture capturing apparatus may be provided in any other device, system, process, or configuration. In some embodiments, capturing and/or receiving may be responsive to a triggering object, action, event, time, and/or other stimulus. Receiving comprises any action or operation by or for a Picture Capturing Apparatus **90**, Digital Picture **525**, and/or other disclosed elements.

At step **6110**, one or more instruction sets for operating a device are received. In some embodiments, an instruction set (i.e. Instruction Set **526**, etc.) may be used or executed by a processor (i.e. Processor **11**, etc.) for operating a device (i.e. Device **98**, etc.). In other embodiments, an instruction set may be part of an application program (i.e. Application Program **18**, etc.) for operating a device. The application can run or execute on one or more processors or other processing elements. In further embodiments, an instruction set may be used, executed, or produced by a logic circuit (i.e. Logic Circuit **250**, etc.) for operating a device. For example, such instruction set may be or include one or more inputs into or outputs from a logic circuit. In further embodiments, an instruction set may be used by an actuator for operating a device. For example, such instruction set may be or include one or more inputs into an actuator. Operating a device includes performing any operations on or with the device. An instruction set may temporally correspond to a digital picture. In some aspects, an instruction set that temporally corresponds to a digital picture may include an instruction set used or executed at the time of receiving or capturing the digital picture. In other aspects, an instruction set that temporally corresponds to a digital picture may include an instruction set used or executed within a certain time period before and/or after receiving or capturing the digital picture. Any time period may be utilized. In further aspects, an instruction set that temporally corresponds to a digital picture may include an instruction set used or executed from the time of capturing of the digital picture to the time of capturing of a next digital picture. In further aspects, an instruction set that temporally corresponds to a digital picture may include an instruction set used or executed from the time of capturing of a preceding digital picture to the time of capturing of the digital picture. Any other temporal relationship or correspondence between digital pictures and correlated instruction sets can be implemented. In general, an instruction set that temporally corresponds to a digital picture enables structuring knowledge of a device's operation at or around the time of the receiving or capturing the digital picture. Such functionality enables spontaneous or seamless learning of a device's operation in various visual surroundings as user operates the device in real life situations. In some designs, an instruction set can be received from a processor, application program, logic circuit, and/or other processing element as the instruction set is being used or executed. In other aspects, an instruction set can be received from a processor, application program, logic circuit, and/or other processing element after the instruction set is used or executed. In further aspects, an instruction set can be received from a processor, application program, logic circuit, and/or other processing element before the instruction set has been used or executed. An instruction set can be received from a running processor, running application program, running logic circuit, and/or other running processing element. As such, an instruction set can be received at runtime. In other designs, an instruction set can be received from an actuator. In some embodiments, an instruction set may include one or more commands, keywords, symbols (i.e. parentheses, brackets, commas, semicolons,

etc.), instructions, operators (i.e. =, <, >, etc.), variables, values, objects (i.e. file handle, network connection, Object1, etc.), data structures (i.e. table, database, user defined data structure, etc.), functions (i.e. Function1( ), FIRST( ), MIN( ), SQRT( ), etc.), parameters, states, signals, inputs, outputs, references thereto, and/or other components for performing an operation. In other embodiments, an instruction set may include source code, bytecode, intermediate code, compiled, interpreted, or otherwise translated code, runtime code, assembly code, machine code, and/or any other computer code. In further embodiments, an instruction set can be compiled, interpreted or otherwise translated into machine code or any intermediate code (i.e. bytecode, assembly code, etc.). In further embodiments, an instruction set may include one or more inputs into and/or outputs from a logic circuit. In further embodiments, an instruction set may include one or more inputs into an actuator. In some aspects, an instruction set can be received from memory (i.e. Memory **12**, etc.), hard drive, or any other storage element or repository. In other aspects, an instruction set can be received over a network such as Internet, local area network, wireless network, and/or other network. In further aspects, an instruction set can be received by an interface (i.e. Acquisition Interface **120**, etc.) configured to obtain instruction sets from a processor, application program, logic circuit, actuator, and/or other element. In general, an instruction set can be received by any element of the system. In some embodiments, receiving may be responsive to a triggering object, action, event, time, and/or other stimulus. Receiving comprises any action or operation by or for an Acquisition Interface **120**, Instruction Set **526**, and/or other disclosed elements.

At step **6115**, the first digital picture is correlated with the one or more instruction sets for operating the device. In some aspects, individual digital pictures can be correlated with one or more instruction sets. In other aspects, streams of digital pictures can be correlated with one or more instruction sets. In further aspects, individual digital pictures or streams of digital pictures can be correlated with temporally corresponding instruction sets as previously described. In further aspects, a digital picture or stream of digital pictures may not be correlated with any instruction sets. Correlating may include structuring or generating a knowledge cell (i.e. Knowledge Cell **800**, etc.) and storing one or more digital pictures correlated with any instruction sets into the knowledge cell. Therefore, knowledge cell may include any data structure or arrangement that can facilitate such storing. A knowledge cell includes a unit of knowledge of how a device operated in a visual surrounding. In some designs, extra information (i.e. Extra Info **527**, etc.) may optionally be used to facilitate enhanced comparisons or decision making in autonomous device operation where applicable. Therefore, any digital picture, instruction set, and/or other element may include or be correlated with extra information. Extra information may include any information useful in comparisons or decision making performed in autonomous device operation. Examples of extra information include time information, location information, computed information, observed information, sensory information, contextual information, and/or other information. In some embodiments, correlating may be responsive to a triggering object, action, event, time, and/or other stimulus. Correlating may be omitted where learning of a device's operations in visual surroundings is not implemented. Correlating comprises any action or operation by or for a Knowledge Structuring Unit **520**, Knowledge Cell **800**, and/or other disclosed elements.

At step **6120**, the first digital picture correlated with the one or more instruction sets for operating the device is stored. A digital picture correlated with one or more instruction sets may be part of a stored plurality of digital pictures correlated with one or more instruction sets. Digital pictures correlated with any instruction sets can be stored in a memory unit or other repository. The previously described knowledge cells comprising digital pictures correlated with any instruction sets can be used in/as neurons, nodes, vertices, or other elements in any of the data structures or arrangements (i.e. neural networks, graphs, sequences, collection of knowledge cells, etc.) used for storing the knowledge of a device's operation in visual surroundings. Knowledge cells may be connected, interrelated, or interlinked into knowledge structures using statistical, artificial intelligence, machine learning, and/or other models or techniques. Such interconnected or interrelated knowledge cells can be used for enabling autonomous device operation. The interconnected or interrelated knowledge cells may be stored or organized into a knowledgebase (i.e. Knowledgebase **530**, etc.). In some embodiments, knowledgebase may be or include a neural network (i.e. Neural Network **530***a*, etc.). In other embodiments, knowledgebase may be or include a graph (i.e. Graph **530***b*, etc.). In further embodiments, knowledgebase may be or include a collection of sequences (i.e. Collection of Sequences **530***c*, etc.). In further embodiments, knowledgebase may be or include a sequence (i.e. Sequence **533**, etc.). In further embodiments, knowledgebase may be or include a collection of knowledge cells (i.e. Collection of Knowledge Cells **530***d*, etc.). In general, knowledgebase may be or include any data structure or arrangement, and/or repository capable of storing the knowledge of a device's operation in various visual surroundings. Knowledgebase may also include or be substituted with various artificial intelligence methods, systems, and/or models for knowledge structuring, storing, and/or representation such as deep learning, supervised learning, unsupervised learning, neural networks (i.e. convolutional neural network, recurrent neural network, deep neural network, etc.), search-based, logic and/or fuzzy logic-based, optimization-based, tree/graph/other data structure-based, hierarchical, symbolic and/or sub-symbolic, evolutionary, genetic, multi-agent, deterministic, probabilistic, statistical, and/or other methods, systems, and/or models. Storing may be omitted where learning of a device's operations in visual surroundings is not implemented. Storing comprises any action or operation by or for a Knowledgebase **530**, Neural Network **530***a*, Graph **530***b*, Collection of Sequences **530***c*, Sequence **533**, Collection of Knowledge Cells **530***d*, Knowledge Cell **800**, Node **852**, Layer **854**, Connection **853**, Similarity Comparison **125**, and/or other disclosed elements.

At step **6125**, a new digital picture is received. Step **6125** may include any action or operation described in Step **6105** as applicable.

At step **6130**, the new digital picture is compared with the first digital picture. Comparing one digital picture with another digital picture may include comparing at least a portion of one digital picture with at least a portion of the other digital picture. In some embodiments, digital pictures may be compared individually. In some aspects, comparing of individual pictures may include comparing one or more regions of one picture with one or more regions of another picture. In other aspects, comparing of individual pictures may include comparing one or more features of one picture with one or more features of another picture. In further aspects, comparing of individual pictures may include comparing pixels of one picture with pixels of another picture.

In other aspects, comparing of individual pictures may include recognizing a person or object in one digital picture and recognizing a person or object in another digital picture, and comparing the person or object from the one digital picture with the person or object from the other digital picture. Comparing may also include other aspects or properties of digital pictures or pixels examples of which comprise color adjustment, size adjustment, content manipulation, transparency (i.e. alpha channel, etc.), use of a mask, and/or others. In other embodiments, digital pictures may be compared collectively as part of streams of digital pictures (i.e. motion pictures, videos, etc.). In some aspects, collective comparing may include comparing one or more digital pictures of one stream of digital pictures with one or more digital pictures of another stream of digital pictures. In some aspects, Dynamic Time Warping (DTW) and/or other techniques can be utilized for comparison and/or aligning temporal sequences (i.e. streams of digital pictures, etc.) that may vary in time or speed. Any combination of the aforementioned and/or other elements or techniques can be utilized in alternate embodiments of the comparing. Comparing may be omitted where anticipating of a device's operation in visual surroundings is not implemented. Comparing comprises any action or operation by or for a Decision-making Unit **540**, Similarity Comparison **125**, and/or other disclosed elements.

At step **6135**, a determination is made that there is at least a partial match between the new digital picture and the first digital picture. In some embodiments, determining at least a partial match between individually compared digital pictures includes determining that similarity between one or more portions of one digital picture and one or more portions of another digital picture exceeds a similarity threshold. In other embodiments, determining at least a partial match between individually compared digital pictures includes determining at least a partial match between one or more portions of one digital picture and one or more portions of another digital picture. A portion of a digital picture may include a region, a feature, a pixel, or other portion. In further embodiments, determining at least a partial match between individually compared digital pictures includes determining that the number or percentage of matching or substantially matching regions of the compared pictures exceeds a threshold number (i.e. 1, 2, 5, 11, 39, etc.) or threshold percentage (i.e. 38%, 63%, 77%, 84%, 98%, etc.). In some aspects, the type of regions, the importance of regions, and/or other elements or techniques relating to regions can be utilized for determining similarity using regions. In further aspects, some of the regions can be omitted in determining similarity using regions. In further aspects, similarity determination can focus on regions of interest from the compared pictures. In further aspects, detection or recognition of persons or objects in regions of the compared pictures can be utilized for determining similarity. Where a reference to a region is used herein it should be understood that a portion of a region or a collection of regions can be used instead of or in addition to the region. In further embodiments, determining at least a partial match between individually compared digital pictures includes determining that the number or percentage of matching or substantially matching features of the compared pictures exceeds a threshold number (i.e. 3, 22, 47, 93, 128, 431, etc.) or a threshold percentage (i.e. 49%, 53%, 68%, 72%, 95%, etc.). In some aspects, the type of features, the importance of features, and/or other elements or techniques relating to features can be utilized for determining similarity using features. In further aspects, some of the features can be omitted in determining similarity using features. In further aspects, similarity determination can focus on features in certain regions of interest from the compared pictures. In further aspects, detection or recognition of persons or objects using features in the compared pictures can be utilized for determining similarity. Where a reference to a feature is used herein it should be understood that a portion of a feature or a collection of features can be used instead of or in addition to the feature. In further embodiments, determining at least a partial match between individually compared digital pictures may include determining that the number or percentage of matching or substantially matching pixels of the compared pictures exceeds a threshold number (i.e. 449, 2219, 92229, 442990, 1000028, etc.) or a threshold percentage (i.e. 39%, 45%, 58%, 72%, 92%, etc.). In some aspects, some of the pixels can be omitted in determining similarity using pixels. In further aspects, similarity determination can focus on pixels in certain regions of interest from the compared pictures. Where a reference to a pixel is used herein it should be understood that a collection of pixels can be used instead of or in addition to the pixel. In further embodiments, determining at least a partial match between individually compared digital pictures may include determining substantial similarity between at least a portion of one digital picture and at least a portion of another digital picture. In some aspects, substantial similarity of individually compared digital pictures can be achieved when a similarity between at least a portion of one digital picture and at least a portion of another digital picture exceeds a similarity threshold. In other aspects, substantial similarity of individually compared digital pictures can be achieved when the number or percentage of matching or substantially matching regions of the compared pictures exceeds a threshold number (i.e. 3, 22, 47, 93, 128, 431, etc.) or a threshold percentage (i.e. 49%, 53%, 68%, 72%, 95%, etc.). In further aspects, substantial similarity of individually compared digital pictures can be achieved when the number or percentage of matching or substantially matching features of the compared pictures exceeds a threshold number (i.e. 1, 2, 5, 11, 39, etc.) or threshold percentage (i.e. 38%, 63%, 77%, 84%, 98%, etc.). In further aspects, substantial similarity of individually compared digital pictures can be achieved when the number or percentage of matching or substantially matching pixels of the compared pictures exceeds a threshold number (i.e. 449, 2219, 92229, 442990, 1000028, etc.) or a threshold percentage (i.e. 39%, 45%, 58%, 72%, 92%, etc.). In some designs, substantial similarity of individually compared digital pictures can be achieved taking into account objects or persons detected within the compared digital pictures. For example, substantial similarity can be achieved if same or similar objects or persons are detected in the compared pictures. In some embodiments, determining at least a partial match between collectively compared digital pictures (i.e. streams of digital pictures [i.e. motion pictures, videos, etc.], etc.) may include determining that the number or percentage of matching or substantially matching digital pictures of the compared streams of digital pictures exceeds a threshold number (i.e. 28, 74, 283, 322, 995, 874, etc.) or a threshold percentage (i.e. 29%, 33%, 58%, 72%, 99%, etc.). In some aspects, Dynamic Time Warping (DTW) and/or other techniques for aligning temporal sequences (i.e. streams of digital pictures, etc.) that may vary in time or speed can be utilized in determining similarity of collectively compared digital pictures or streams digital pictures. In other aspects, the order of digital pictures, the importance of digital pictures, and/or other elements or techniques relating to digital pictures can be utilized for determining similarity of

collectively compared digital pictures or streams digital pictures. In further aspects, some of the digital pictures can be omitted in determining similarity of collectively compared digital pictures or streams digital pictures. In some designs, a threshold for a number or percentage similarity can be used to determine a match or substantial match between any of the aforementioned elements. Any combination of the aforementioned and/or other elements or techniques can be utilized in alternate embodiments. Determining may be omitted where anticipating of a device's operation in visual surroundings is not implemented. Determining comprises any action or operation by or for a Decision-making Unit **540**, Similarity Comparison **125**, and/or other disclosed elements.

At step **6140**, the one or more instruction sets for operating the device correlated with the first digital picture are executed. The executing may be performed in response to the aforementioned determining. The executing may be caused by VSADO Unit **100**, Artificial Intelligence Unit **110**, and/or other disclosed elements. An instruction set may be executed by a processor (i.e. Processor **11**, etc.), application program (i.e. Application Program **18**, etc.), logic circuit (i.e. Logic Circuit **250**, etc.), and/or other processing element. An instruction set may be executed or acted upon by an actuator. Executing may include executing one or more alternate instruction sets instead of or prior to an instruction set that would have been executed in a regular course of execution. In some aspects, alternate instruction sets comprise one or more instruction sets for operating a device correlated with one or more digital pictures. In some embodiments, executing may include modifying a register or other element of a processor with one or more alternate instruction sets. Executing may also include redirecting a processor to one or more alternate instruction sets. In other embodiments, processor may be or comprises a logic circuit. Executing may include modifying an element of a logic circuit with one or more alternate instruction sets, redirecting the logic circuit to one or more alternate instruction sets, replacing the inputs into the logic circuit with one or more alternate inputs or instruction sets, and/or replacing the outputs from the logic circuit with one or more alternate outputs or instruction sets. In further embodiments, a processor may include an application including instruction sets for operating a device, the application running on the processor. In some aspects, executing includes executing one or more alternate instruction sets as part of the application. In other aspects, executing includes modifying the application. In further aspects, executing includes redirecting the application to one or more alternate instruction sets. In further aspects, executing includes modifying one or more instruction sets of the application. In further aspects, executing includes modifying the application's source code, bytecode, intermediate code, compiled code, interpreted code, translated code, runtime code, assembly code, machine code, or other code. In further aspects, executing includes modifying memory, processor register, storage, repository or other element where the application's instruction sets are stored or used. In further aspects, executing includes modifying instruction sets used for operating an object of the application. In further aspects, executing includes modifying an element of a processor, an element of a device, a virtual machine, a runtime engine, an operating system, an execution stack, a program counter, or a user input used in running the application. In further aspects, executing includes modifying the application at source code write time, compile time, interpretation time, translation time, linking time, loading time, runtime, or other time. In further aspects, executing includes modifying one or more of the application's lines of code, statements, instructions, functions, routines, subroutines, basic blocks, or other code segments. In further aspects, executing includes a manual, automatic, dynamic, just in time (JIT), or other instrumentation of the application. In further aspects, executing includes utilizing one or more of a .NET tool, .NET application programming interface (API), Java tool, Java API, operating system tool, independent tool or other tool for modifying the application. In further aspects, executing includes utilizing a dynamic, interpreted, scripting or other programming language. In further aspects, executing includes utilizing dynamic code, dynamic class loading, or reflection. In further aspects, executing includes utilizing assembly language. In further aspects, executing includes utilizing metaprogramming, self-modifying code, or an application modification tool. In further aspects, executing includes utilizing just in time (JIT) compiling, JIT interpretation, JIT translation, dynamic recompiling, or binary rewriting. In further aspects, executing includes utilizing dynamic expression creation, dynamic expression execution, dynamic function creation, or dynamic function execution. In further aspects, executing includes adding or inserting additional code into the application's code. In further aspects, executing includes modifying, removing, rewriting, or overwriting the application's code. In further aspects, executing includes branching, redirecting, extending, or hot swapping the application's code. Branching or redirecting an application's code may include inserting a branch, jump, or other means for redirecting the application's execution. Executing comprises any action or operation by or for a Processor **11**, Application Program **18**, Logic Circuit **250**, Modification Interface **130**, and/or other disclosed elements.

At step **6145**, one or more operations defined by the one or more instruction sets for operating the device correlated with the first digital picture are performed by the device. The one or more operations may be performed in response to the aforementioned executing. An operation includes any operation that can be performed by, with, or on the device. An operation includes any operation that can be performed by, with, or on an actuator. In one example, an operation includes any operation (i.e. moving, maneuvering, collecting, unloading, lifting, screwing, gripping, etc.) with or by a computing enabled machine (i.e. Computing Enabled Machine **98***a*, etc.). In a further example, an operation includes any operation with or by a fixture (i.e. Fixture **98***b*, etc.). In a further example, an operation includes any operation (i.e. setting, starting, stopping, etc.) on or by a control device (i.e. Control Device **98***c*, etc.). In one example, an operation includes any operation on a smartphone (i.e. Smartphone **98***d*, etc.) or other mobile computer. In a further example, an operation includes any operation on or by a computer or computing enabled device. In a further example, an operation includes any motion or operation on or by an actuator. One of ordinary skill in art will recognize that, while all possible variations of operations on a device are too voluminous to list and limited only by the device's design and/or user's utilization, other operations are within the scope of this disclosure in various implementations.

Referring to FIG. **32**, the illustration shows an embodiment of a method **6200** for learning and/or using visual surrounding for autonomous device operation. The method can be used on a computing device or system to enable learning of a device's operation in various visual surroundings and enable autonomous device operation in similar visual surroundings. Method **6200** may include any action or operation of any of the disclosed methods such as method

6100, 6300, 6400, 6500, 6600, and/or others. Additional steps, actions, or operations can be included as needed, or some of the disclosed ones can be optionally omitted, or a different combination or order thereof can be implemented in alternate embodiments of method 6200.

At step 6205, a first digital picture is received. Step 6205 may include any action or operation described in Step 6105 of method 6100 as applicable.

At step 6210, one or more instruction sets for operating a device are received. Step 6210 may include any action or operation described in Step 6110 of method 6100 as applicable.

At step 6215, the first digital picture correlated with the one or more instruction sets for operating the device are learned. Step 6215 may include any action or operation described in Step 6115 and/or Step 6120 of method 6100 as applicable.

At step 6220, a new digital picture is received. Step 6220 may include any action or operation described in Step 6125 of method 6100 as applicable.

At step 6225, the one or more instruction sets for operating the device correlated with the first digital picture are anticipated based on at least a partial match between the new digital picture and the first digital picture. Step 6225 may include any action or operation described in Step 6130 and/or Step 6135 of method 6100 as applicable.

At step 6230, the one or more instruction sets for operating the device correlated with the first digital picture are executed. Step 6230 may include any action or operation described in Step 6140 of method 6100 as applicable.

At step 6235, one or more operations defined by the one or more instruction sets for operating the device correlated with the first digital picture are performed by the device. Step 6235 may include any action or operation described in Step 6145 of method 6100 as applicable.

Referring to FIG. 33, the illustration shows an embodiment of a method 6300 for learning and/or using visual surrounding for autonomous device operation. The method can be used on a computing device or system to enable learning of a device's operation in various visual surroundings and enable autonomous device operation in similar visual surroundings. Method 6300 may include any action or operation of any of the disclosed methods such as method 6100, 6200, 6400, 6500, 6600, and/or others. Additional steps, actions, or operations can be included as needed, or some of the disclosed ones can be optionally omitted, or a different combination or order thereof can be implemented in alternate embodiments of method 6300.

At step 6305, a first stream of digital pictures is received. Step 6305 may include any action or operation described in Step 6105 of method 6100 as applicable.

At step 6310, one or more instruction sets for operating a device are received. Step 6310 may include any action or operation described in Step 6110 of method 6100 as applicable.

At step 6315, the first stream of digital pictures is correlated with the one or more instruction sets for operating the device. Step 6315 may include any action or operation described in Step 6115 of method 6100 as applicable.

At step 6320, the first stream of digital pictures correlated with the one or more instruction sets for operating the device is stored. Step 6320 may include any action or operation described in Step 6120 of method 6100 as applicable.

At step 6325, a new stream of digital pictures is received. Step 6325 may include any action or operation described in Step 6125 of method 6100 as applicable.

At step 6330, the new stream of digital pictures is compared with the first stream of digital pictures. Step 6330 may include any action or operation described in Step 6130 of method 6100 as applicable.

At step 6335, a determination is made that there is at least a partial match between the new stream of digital pictures and the first stream of digital pictures. Step 6335 may include any action or operation described in Step 6135 of method 6100 as applicable.

At step 6340, the one or more instruction sets for operating the device correlated with the first stream of digital pictures are executed. Step 6340 may include any action or operation described in Step 6140 of method 6100 as applicable.

At step 6345, one or more operations defined by the one or more instruction sets for operating the device correlated with the first stream of digital pictures are performed by the device. Step 6345 may include any action or operation described in Step 6145 of method 6100 as applicable.

Referring to FIG. 34, the illustration shows an embodiment of a method 6400 for learning and/or using visual surrounding for autonomous device operation. The method can be used on a computing device or system to enable learning of a device's operation in various visual surroundings and enable autonomous device operation in similar visual surroundings. Method 6400 may include any action or operation of any of the disclosed methods such as method 6100, 6200, 6300, 6500, 6600, and/or others. Additional steps, actions, or operations can be included as needed, or some of the disclosed ones can be optionally omitted, or a different combination or order thereof can be implemented in alternate embodiments of method 6400.

At step 6405, a first digital picture is received. Step 6405 may include any action or operation described in Step 6105 of method 6100 as applicable.

At step 6410, at least one input are received, wherein the at least one input are also received by a logic circuit, and wherein the logic circuit is configured to receive inputs and produce outputs, the outputs for operating a device. Step 6410 may include any action or operation described in Step 6110 of method 6100 as applicable.

At step 6415, the first digital picture is correlated with the at least one input. Step 6415 may include any action or operation described in Step 6115 of method 6100 as applicable.

At step 6420, the first digital picture correlated with the at least one input is stored. Step 6420 may include any action or operation described in Step 6120 of method 6100 as applicable.

At step 6425, a new digital picture is received. Step 6425 may include any action or operation described in Step 6125 of method 6100 as applicable.

At step 6430, the new digital picture is compared with the first digital picture. Step 6430 may include any action or operation described in Step 6130 of method 6100 as applicable.

At step 6435, a determination is made that there is at least a partial match between the new digital picture and the first digital picture. Step 6435 may include any action or operation described in Step 6135 of method 6100 as applicable.

At step 6440, the at least one input correlated with the first digital picture are received by the logic circuit.

Step 6440 may include any action or operation described in Step 6140 of method 6100 as applicable.

At step 6445, at least one operation defined by at least one output for operating the device produced by the logic circuit

are performed by the device. Step **6445** may include any action or operation described in Step **6145** of method **6100** as applicable.

Referring to FIG. **35**, the illustration shows an embodiment of a method **6500** for learning and/or using visual surrounding for autonomous device operation. The method can be used on a computing device or system to enable learning of a device's operation in various visual surroundings and enable autonomous device operation in similar visual surroundings. Method **6500** may include any action or operation of any of the disclosed methods such as method **6100**, **6200**, **6300**, **6400**, and/or others. Additional steps, actions, or operations can be included as needed, or some of the disclosed ones can be optionally omitted, or a different combination or order thereof can be implemented in alternate embodiments of method **6500**.

At step **6505**, a first digital picture is received. Step **6505** may include any action or operation described in Step **6105** of method **6100** as applicable.

At step **6510**, at least one output are received, the at least one output transmitted from a logic circuit, wherein the logic circuit is configured to receive inputs and produce outputs, the outputs for operating a device. Step **6510** may include any action or operation described in Step **6110** of method **6100** as applicable.

At step **6515**, the first digital picture is correlated with the at least one output. Step **6515** may include any action or operation described in Step **6115** of method **6100** as applicable.

At step **6520**, the first digital picture correlated with the at least one output is stored. Step **6520** may include any action or operation described in Step **6120** of method **6100** as applicable.

At step **6525**, a new digital picture is received. Step **6525** may include any action or operation described in Step **6125** of method **6100** as applicable.

At step **6530**, the new digital picture is compared with the first digital picture. Step **6530** may include any action or operation described in Step **6130** of method **6100** as applicable.

At step **6535**, a determination is made that there is at least a partial match between the new digital picture and the first digital picture. Step **6535** may include any action or operation described in Step **6135** of method **6100** as applicable.

At step **6540**, at least one operation defined by the at least one output correlated with the first digital picture are performed by the device. Step **6540** may include any action or operation described in Step **6145** of method **6100** as applicable.

Referring to FIG. **36**, the illustration shows an embodiment of a method **6600** for learning and/or using visual surrounding for autonomous device operation. The method can be used on a computing device or system to enable learning of a device's operation in various visual surroundings and enable autonomous device operation in similar visual surroundings. Method **6600** may include any action or operation of any of the disclosed methods such as method **6100**, **6200**, **6300**, **6400**, **6500**, and/or others. Additional steps, actions, or operations can be included as needed, or some of the disclosed ones can be optionally omitted, or a different combination or order thereof can be implemented in alternate embodiments of method **6600**.

At step **6605**, a first digital picture is received. Step **6605** may include any action or operation described in Step **6105** of method **6100** as applicable.

At step **6610**, at least one input are received, wherein the at least one input are also received by an actuator, and wherein the actuator is configured to receive inputs and perform motions. Step **6610** may include any action or operation described in Step **6110** of method **6100** as applicable.

At step **6615**, the first digital picture is correlated with the at least one input. Step **6615** may include any action or operation described in Step **6115** of method **6100** as applicable.

At step **6620**, the first digital picture correlated with the at least one input is stored. Step **6620** may include any action or operation described in Step **6120** of method **6100** as applicable.

At step **6625**, a new digital picture is received. Step **6625** may include any action or operation described in Step **6125** of method **6100** as applicable.

At step **6630**, the new digital picture is compared with the first digital picture. Step **6630** may include any action or operation described in Step **6130** of method **6100** as applicable.

At step **6635**, a determination is made that there is at least a partial match between the new digital picture and the first digital picture. Step **6635** may include any action or operation described in Step **6135** of method **6100** as applicable.

At step **6640**, the at least one input correlated with the first digital picture are received by the actuator. Step **6640** may include any action or operation described in Step **6140** of method **6100** as applicable.

At step **6645**, at least one motion defined by the at least one input correlated with the first digital picture are performed by the actuator. Step **6645** may include any action or operation described in Step **6145** of method **6100** as applicable.

Referring to FIG. **37**, in some exemplary embodiments, Device **98** may be or include a Computing-enabled Machine **98***a*. Examples of Computing-enabled Machine **98***a* comprise a loader, a bulldozer, an excavator, a crane, a forklift, a truck, an assembly machine, a material/object handling machine, a sorting machine, an industrial machine, a kitchen appliance, a robot, a tank, an airplane, a helicopter, a vessel, a submarine, a ground/aerial/aquatic vehicle, and/or other computing-enabled machine. In some aspects, Computing-enabled Machine **98***a* may itself include computing capabilities. In other aspects, computing capabilities may be included in a remote computing device (i.e. server, etc.) and provided to Computing-enabled Machine **98***a* (i.e. via a network, etc.). Computing-enabled Machine **98***a* may be operated by User **50** in person or remotely. Computing-enabled Machine **98***a* may include Picture Capturing Apparatus **90** such as a motion picture, still picture, or other camera that captures one or more Digital Pictures **525** of Computing-enabled Machine's **98***d* surrounding. Computing-enabled Machine **98***a* may also include or be controlled by Logic Circuit **250** (i.e. microcontroller, etc.), Processor **11** (i.e. including any Application Program **18** running thereon, etc.), and/or other processing element that receives User's **50** (i.e. operator's, etc.) operating directions and causes desired operations with Computing-enabled Machine **98***a* such as moving, maneuvering, collecting, unloading, pushing, digging, lifting, and/or other operations. User **50** can interact with Logic Circuit **250**, Processor **11**, Application Program **18**, and/or other processing element through inputting operating directions (i.e. manipulating levers, pressing buttons, etc.) via Human-machine Interface **23** such as one or more levers or other input device. For instance, responsive to User's **50** manipulating one or more levers, Logic Circuit **250** or Processor **11** may cause Computing-enabled Machine's **98***d* arm with bucket to collect a load,

one or more motors or other actuators to move or maneuver Computing-enabled Machine **98***a*, lifting system (i.e. hydraulic, pneumatic, mechanical, electrical, etc.) to lift a load, and/or arm with bucket to unload a load. Computing-enabled Machine **98***a* may also include or be coupled to VSADO Unit **100**. VSADO Unit **100** may be embedded (i.e. integrated, etc.) into or coupled to Computing-enabled Machine's **98***d* Logic Circuit **250**, Processor **11**, and/or other processing element. VSADO Unit **100** may also be a program embedded (i.e. integrated, etc.) into or interfaced with Application Program **18** running on Processor **11** and/or other processing element. VSADO Unit **100** can obtain Instruction Sets **526** used or executed by Logic Circuit **250**, Processor **11**, Application Program **18**, and/or other processing element. In some aspects, Instruction Sets **526** may include one or more inputs into or outputs from Computing-enabled Machine's **98***d* Logic Circuit **250** (i.e. microcontroller, etc.). In other aspects, Instruction Sets **526** may include one or more instruction sets from Computing-enabled Machine's **98***d* Processor's **11** registers or other components. In further aspects, Instruction Sets **526** may include one or more instruction sets used or executed in Application Program **18** running on Processor **11** and/or other processing element. VSADO Unit **100** may also optionally obtain any Extra Info **527** (i.e. time, location, computed, observed, sensory, and/or other information, etc.) related to Computing-enabled Machine's **98***d* operation. As User **50** operates Computing-enabled Machine **98***a* in various visual surroundings as shown, VSADO Unit **100** may learn Computing-enabled Machine's **98***d* operations in visual surroundings by correlating Digital Pictures **525** of Computing-enabled Machine's **98***d* surrounding with one or more Instruction Sets **526** used or executed by Logic Circuit **250**, Processor **11**, Application Program **18**, and/or other processing element. Any Extra Info **527** related to Computing-enabled Machine's **98***d* operation may also optionally be correlated with Digital Pictures **525** of Computing-enabled Machine's **98***d* surrounding. VSADO Unit **100** may store this knowledge into Knowledgebase **530** (i.e. Neural Network **530***a*, Graph **530***b*, Collection of Sequences **530***c*, Sequence **533**, Collection of Knowledge Cells **530***d*, etc.). In the future, VSADO Unit **110** may compare incoming Digital Pictures **525** of Computing-enabled Machine's **98***d* surrounding with previously learned Digital Pictures **525** including optionally using any Extra Info **527** for enhanced decision making. If substantially similar or at least a partial match is found or determined, the Instruction Sets **526** correlated with the previously learned Digital Pictures **525** can be autonomously executed by Logic Circuit **250**, Processor **11**, Application Program **18**, and/or other processing element, thereby enabling autonomous operation of Computing-enabled Machine **98***a* in a similar visual surrounding as in a previously learned one. For instance, Computing-enabled Machine **98***a* (i.e. loader, etc.) comprising VSADO Unit **100** may learn User **50**-directed collecting, moving, maneuvering, lifting, and/or unloading in a visual surrounding that includes a pile of material, truck, and/or other objects with which Computing-enabled Machine **98***a* may need to interact. In the future, when visual surrounding that includes same or similar objects is encountered, or when same or similar objects are detected, Computing-enabled Machine **98***a* may implement collecting, moving, maneuvering, lifting, and/or unloading autonomously.

Referring to FIG. **38**, in some exemplary embodiments, Device **98** may be or include a Computing-enabled Machine **98***a* comprising or coupled to a plurality of Picture Capturing Apparatuses **90**. In one example, different Picture Capturing Apparatuses **90** may capture Digital Pictures **525** of different angles of Computing-enabled Machine's **98***d* front. In another example, different Picture Capturing Apparatuses **90** may capture Digital Pictures **525** of the front, sides, and/or back of Computing-enabled Machine **98***a*. In a further example as shown, different Picture Capturing Apparatuses **90** may be placed on different sub-devices, sub-systems, or elements of Computing-enabled Machine **98***a*. Specifically, for instance, Picture Capturing Apparatus **90***a* may be placed on the roof of Computing-enabled Machine **98***a* (i.e. loader, etc.), Picture Capturing Apparatus **90***b* may be placed on the arm of Computing-enabled Machine **98***a*, and Picture Capturing Apparatus **90***c* may be placed on the bucket of Computing-enabled Machine **98***a*. In some designs where multiple Picture Capturing Apparatuses **90** are utilized, as User **50** operates Computing-enabled Machine **98***a* in various visual surroundings, VSADO Unit **100** may learn Computing-enabled Machine's **98***d* operations in visual surroundings by correlating collective Digital Pictures **525** of Computing-enabled Machine's **98***d* surrounding from multiple Picture Capturing Apparatuses **90** with one or more Instruction Sets **526** used or executed by Logic Circuit **250**, Processor **11**, Application Program **18**, and/or other processing element. In other designs where multiple Picture Capturing Apparatuses **90** are utilized, multiple VSADO Units **100** may also be utilized (i.e. one VSADO Unit **100** for each Picture Capturing Apparatus **90**, etc.). In such designs, as User **50** operates Computing-enabled Machine **98***a* in various visual surroundings, VSADO Unit **100** may learn Computing-enabled Machine's **98***d* operations in visual surroundings by correlating Digital Pictures **525** of Computing-enabled Machine's **98***d* surrounding from Picture Capturing Apparatus **90** assigned to the VSADO Unit **100** with one or more Instruction Sets **526** used or executed by Logic Circuit **250**, Processor **11**, Application Program **18**, and/or other processing element. Each sub-device, sub-system, or element can, therefore, perform its own learning and/or decision making in autonomous operation.

In some embodiments, Computing-enabled Machine **98***a* may include a plurality of Logic Circuits **250** (i.e. microcontrollers, etc.), Processors **11**, Application Programs **18**, and/or other processing elements. In some aspects, each processing element may control a sub-device, sub-system, or element of Computing-enabled Machine's **98***d*. For example, one Processor **11** (i.e. including any Application Programs **18** running thereon, etc.) may control the moving system (i.e. drivetrain, powertrain, etc.) of Computing-enabled Machine **98***a* (i.e. loader), one Logic Circuit **250** may control an arm of Computing-enabled Machine **98***a*, and a second Logic Circuit **250** may control a bucket of Computing-enabled Machine **98***a*. In some designs where multiple processing elements are utilized, as User **50** operates Computing-enabled Machine **98***a* in various visual surroundings, VSADO Unit **100** may learn Computing-enabled Machine's **98***d* operations in visual surroundings by correlating Digital Pictures **525** of Computing-enabled Machine's **98***d* surrounding with collective one or more Instruction Sets **526** used or executed by a plurality of Logic Circuits **250**, Processors **11**, Application Programs **18**, and/or other processing elements. In other designs where multiple processing elements are utilized, multiple VSADO Units **100** may also be utilized (i.e. one VSADO Unit **100** for each processing element, etc.). In such designs, as User **50** operates Computing-enabled Machine **98***a* in various visual surroundings, VSADO Unit **100** may learn Computing-enabled Machine's **98***d* operations in visual surround-

ings by correlating Digital Pictures **525** of Computing-enabled Machine's **98***d* surrounding with one or more Instruction Sets **526** used or executed by Logic Circuit **250**, Processor **11**, Application Program **18**, and/or other processing element assigned to the VSADO Unit **100**.

In some embodiments, Computing-enabled Machine **98***a* (i.e. loader, etc.) may be controlled by a combination of VSADO Unit **100** and other systems and/or techniques. In some aspects, Computing-enabled Machine **98***a* controlled by VSADO Unit **100** may encounter a visual surrounding that has not been encountered or learned before. In such situations, User **50** and/or non-VSADO system may take control of Computing-enabled Machine's **98***d* operation. VSADO Unit **100** may take control again when Computing-enabled Machine **98***a* encounters a previously learned visual surrounding. Naturally, VSADO Unit **100** can learn Computing-enabled Machine's **98***d* operation in visual surroundings while User **50** and/or non-VSADO system is in control of Device **98**, thereby reducing or eliminating the need for future involvement of User **50** and/or non-VSADO system. In some implementations, one User **50** can control or assist in controlling multiple Computing-enabled Machines **98***d* comprising VSADO Units **100**. For example, User **50** can control or assist in controlling a Computing-enabled Machine **98***a* that may encounter a visual surrounding that has not been encountered or learned before while the Computing-enabled Machines **98***d* operating in previously learned visual surroundings can operate autonomously. In other aspects, Computing-enabled Machine **98***a* may be primarily controlled by User **50** and/or non-VSADO system. User **50** and/or non-VSADO system can release control to VSADO Unit **100** for any reason (i.e. User **50** gets tired or distracted, non-VSADO system gets stuck or cannot make a decision, etc.), at which point Computing-enabled Machine **98***a* can be controlled by VSADO Unit **100**. In further aspects, VSADO Unit **100** may take control in certain special visual surroundings where VSADO Unit **100** may offer superior performance even if User **50** and/or non-VSADO system may generally be preferred. Once Computing-enabled Machine **98***a* leaves such special visual surrounding, VSADO Unit **100** may release control to User **50** and/or non-VSADO system. In general, VSADO Unit **100** can take control from, share control with, or release control to User **50**, non-VSADO system, and/or other system or process at any time, under any circumstances, and remain in control for any period of time as needed.

In some embodiments, VSADO Unit **100** may control one or more sub-devices, sub-systems, or elements of Computing-enabled Machine **98***a* (i.e. loader) while User **50** and/or non-VSADO system may control other one or more sub-devices, sub-systems, or elements of Computing-enabled Machine **98***a*. For example, User **50** and/or non-VSADO system may control the moving system (i.e. drivetrain, powertrain, etc.) of Computing-enabled Machine **98***a*, while VSADO Unit **100** may control an arm and bucket of Computing-enabled Machine **98***a*. Any other combination of controlling various sub-devices, sub-systems, or elements of Computing-enabled Machine **98***a* by VSADO Unit **100** and User **50** and/or non-VSADO system can be implemented.

One of ordinary skill in art will understand that the features, functionalities, and embodiments described with respect to Computing-enabled Machine **98***a* can similarly be implemented on any computing enabled machine such as a bulldozer, an excavator, a crane, a forklift, a truck, an assembly machine, a material/object handling machine, a sorting machine, an industrial machine, a kitchen appliance, a robot, a tank, an airplane, a helicopter, a vessel, a submarine, a ground/aerial/aquatic vehicle, and/or other computing-enabled machine.

Referring to FIG. **39**, in some exemplary embodiments, Device **98** may be or include a Fixture **98***b*. Examples of Fixture **98***b* comprise a fan, a light, automated blind, and/or other fixture. Fixture **98***b* may include Picture Capturing Apparatus **90** such as a motion picture, still picture, or other camera that captures one or more Digital Pictures **525** of Fixture's **98***b* surrounding. Fixture **98***b* may also include or be controlled by Logic Circuit **250** (i.e. microcontroller, etc.), Processor **11** (i.e. including any Application Program **18** running thereon, etc.), and/or other processing element that receives User's **50** operating directions and causes desired operations with Fixture **98***b* such as setting speed of a fan, adjusting intensity of a light, adjusting angle of an automated blind, and/or other operations. User **50** can interact with Logic Circuit **250**, Processor **11**, Application Program **18**, and/or other processing element through inputting operating directions (i.e. pressing control buttons, switching switches, etc.) via Human-machine Interface **23** such as a controller, switch, or other input device. For instance, responsive to User's **50** pressing a control button, Logic Circuit **250** or Processor **11** may cause Fixture **98***b* to set a speed (i.e. in the case of a fan, etc.). Fixture **98***b* may also include or be coupled to VSADO Unit **100**. VSADO Unit **100** may be embedded (i.e. integrated, etc.) into or coupled to Fixture's **98***b* Logic Circuit **250**, Processor **11**, and/or other processing element. VSADO Unit **100** may also be a program embedded (i.e. integrated, etc.) into or interfaced with Application Program **18** running on Processor **11** and/or other processing element. VSADO Unit **100** can obtain Instruction Sets **526** used or executed by Logic Circuit **250**, Processor **11**, Application Program **18**, and/or other processing element. In some aspects, Instruction Sets **526** may include one or more inputs into or outputs from Fixture's **98***b* Logic Circuit **250** (i.e. microcontroller, etc.). In other aspects, Instruction Sets **526** may include one or more instruction sets from Fixture's **98***b* Processor's **11** registers or other components. In further aspects, Instruction Sets **526** may include one or more instruction sets used or executed in Application Program **18** running on Processor **11** and/or other processing element. VSADO Unit **100** may also optionally obtain any Extra Info **527** (i.e. time, location, computed, observed, sensory, and/or other information, etc.) related to Fixture's **98***b* operation. As User **50** operates Fixture **98***b* in a visual surrounding as shown, VSADO Unit **100** may learn Fixture's **98***b* operation in the visual surrounding by correlating Digital Pictures **525** of Fixture's **98***b* surrounding with one or more Instruction Sets **526** used or executed by Logic Circuit **250**, Processor **11**, Application Program **18**, and/or other processing element. Any Extra Info **527** related to Fixture's **98***b* operation may also optionally be correlated with Digital Pictures **525** of Fixture's **98***b* surrounding. VSADO Unit **100** may store this knowledge into Knowledgebase **530** (i.e. Neural Network **530***a*, Graph **530***b*, Collection of Sequences **530***c*, Sequence **533**, Collection of Knowledge Cells **530***d*, etc.). In the future, VSADO Unit **110** may compare incoming Digital Pictures **525** of Fixture's **98***b* surrounding with previously learned Digital Pictures **525** including optionally using any Extra Info **527** for enhanced decision making. If substantially similar or at least a partial match is found or determined, the Instruction Sets **526** correlated with the previously learned Digital Pictures **525** can be autonomously executed by Logic Circuit **250**, Processor **11**, Application Program **18**, and/or other processing element, thereby enabling autonomous operation

of Fixture **98***b* in a similar visual surrounding as in a previously learned one. For instance, Fixture **98***b* (i.e. ceiling fan, etc.) comprising VSADO Unit **100** may learn User's **50** setting speed of Fixture **98***b* in a visual surrounding that includes User **50** entering or being present in a room. In the future, when visual surrounding that includes User **50** entering or being present in the room, or when User **50** or his/her body part (i.e. face, etc.) is detected, Fixture **98***b* may implement setting of its speed autonomously. In some aspects, Fixture **98***b* comprising VSADO Unit **100** may engage autonomous operation (i.e. autonomous fan speed setting, etc.) if a specific person is detected by using facial recognition, thereby personalizing the operation of Fixture **98***b*. In other aspects, Fixture **98***b* may engage autonomous operation (i.e. autonomous fan speed setting, etc.) if any person is detected by using person or object recognition.

Referring to FIG. **40**, in some exemplary embodiments, Device **98** may be or include a Control Device **98***c*. Examples of Control Device **98***c* comprise a thermostat, a control panel, a remote or other controller, and/or other control device. Control Device **98***c* may include Picture Capturing Apparatus **90** such as a motion picture, still picture, or other camera that captures one or more Digital Pictures **525** of Control Device's **98***c* surrounding. Control Device **98***c* may also include Logic Circuit **250** (i.e. microcontroller, etc.), Processor **11** (i.e. including any Application Program **18** running thereon, etc.), and/or other processing element that receives User's **50** operating directions and causes desired operations on a device or system controlled by Control Device **98***c* such as regulating temperature of an air conditioning system, and/or other operations. User **50** can interact with Logic Circuit **250**, Processor **11**, Application Program **18**, and/or other processing element through inputting operating directions (i.e. pressing control buttons, etc.) via Human-machine Interface **23** such as a control panel or other input device. For instance, responsive to User's **50** pressing a control button, Logic Circuit **250** or Processor **11** may cause Control Device **98***c* to increase or decrease a temperature of an air conditioning system. Control Device **98***c* may also include or be coupled to VSADO Unit **100**. VSADO Unit **100** may be embedded (i.e. integrated, etc.) into or coupled to Control Device's **98***c* Logic Circuit **250**, Processor **11**, and/or other processing element. VSADO Unit **100** may also be a program embedded (i.e. integrated, etc.) into or interfaced with Application Program **18** running on Processor **11** and/or other processing element. VSADO Unit **100** can obtain Instruction Sets **526** used or executed by Logic Circuit **250**, Processor **11**, Application Program **18**, and/or other processing element. In some aspects, Instruction Sets **526** may include one or more inputs into or outputs from Control Device's **98***c* Logic Circuit **250** (i.e. microcontroller, etc.). In other aspects, Instruction Sets **526** may include one or more instruction sets from Control Device's **98***c* Processor's **11** registers or other components. In further aspects, Instruction Sets **526** may include one or more instruction sets used or executed in Application Program **18** running on Processor **11** and/or other processing element. VSADO Unit **100** may also optionally obtain any Extra Info **527** (i.e. time, location, computed, observed, sensory, and/or other information, etc.) related to Control Device's **98***c* operation. As User **50** operates Control Device **98***c* in a visual surrounding as shown, VSADO Unit **100** may learn Control Device's **98***c* operation in the visual surrounding by correlating Digital Pictures **525** of Control Device's **98***c* surrounding with one or more Instruction Sets **526** used or executed by Logic Circuit **250**, Processor **11**, Application Program **18**, and/or other processing element. Any Extra Info **527** related to Control Device's **98***c* operation may also optionally be correlated with Digital Pictures **525** of Control Device's **98***c* surrounding. VSADO Unit **100** may store this knowledge into Knowledgebase **530** (i.e. Neural Network **530***a*, Graph **530***b*, Collection of Sequences **530***c*, Sequence **533**, Collection of Knowledge Cells **530***d*, etc.). In the future, VSADO Unit **110** may compare incoming Digital Pictures **525** of Control Device's **98***c* surrounding with previously learned Digital Pictures **525** including optionally using any Extra Info **527** for enhanced decision making. If substantially similar or at least a partial match is found or determined, the Instruction Sets **526** correlated with the previously learned Digital Pictures **525** can be autonomously executed by Logic Circuit **250**, Processor **11**, Application Program **18**, and/or other processing element, thereby enabling autonomous operation of Control Device **98***c* in a similar visual surrounding as in a previously learned one. For instance, Control Device **98***c* comprising VSADO Unit **100** may learn User's **50** setting temperature of an air conditioning system controlled by Control Device **98***c* in a visual surrounding that includes User **50** entering or being present in a room. In the future, when visual surrounding that includes User **50** entering or being present in the room, or when User **50** or his/her body part (i.e. face, etc.) is detected, Control Device **98***c* may implement setting temperature of the air conditioning system autonomously. In some aspects, Control Device **98***c* may engage autonomous operation (i.e. autonomous temperature setting of an air conditioning system, etc.) if a specific person is detected by using facial recognition, thereby personalizing the operation of Control Device **98***c*. In other aspects, Control Device **98***c* may engage autonomous operation (i.e. autonomous temperature setting of an air conditioning system, etc.) if any person is detected by using person or object recognition.

Referring to FIG. **41**, in some exemplary embodiments, Device **98** may be or include a Smartphone **98***d*. Examples of Smartphone **98***d* comprise Apple iPhone, Samsung Galaxy, Microsoft Lumia, and/or other smartphone. Smartphone **98***d* may include Picture Capturing Apparatus **90** such as a motion picture, still picture, or other camera that captures one or more Digital Pictures **525** of Smartphone's **98***a* surrounding. Smartphone **98***d* may include Processor **11** and one or more Application Programs **18** such as a phone control application that receives User's **50** operating directions and causes desired operations with Smartphone **98***d* such as making a call, ending a call, increasing volume, setting Smartphone **98***d* on vibrate mode, and/or other operations. User **50** can interact with Processor **11** and/or Application Program **18** through inputting operating directions (i.e. touching touchscreen elements, etc.) via Human-machine Interface **23** such as a touchscreen or other input device. For instance, responsive to User's **50** touching a touchscreen element, Processor **11** and/or Application Program **18** may cause

Smartphone **98***d* to go into a vibrate mode. Smartphone **98***d* may also include or be coupled to VSADO Unit **100**. VSADO Unit **100** may be embedded (i.e. integrated, etc.) into or coupled to Smartphone's **98***a* Processor **11** and/or other processing element. VSADO Unit **100** may also be a program embedded (i.e. integrated, etc.) into or interfaced with Application Program **18** running on Processor **11** and/or other processing element. VSADO Unit **100** can obtain Instruction Sets **526** used or executed by Processor **11**, Application Program **18**, and/or other processing element. In some aspects, Instruction Sets **526** may include one or more instruction sets used or executed in Application Program **18** running on Processor **11** and/or other processing element. In

other aspects, Instruction Sets **526** may include one or more instruction sets from Smartphone's **98***a* Processor's **11** registers or other components. VSADO Unit **100** may also optionally obtain any Extra Info **527** (i.e. time, location, computed, observed, sensory, and/or other information, etc.) related to Smartphone's **98***a* operation. As User **50** operates Smartphone **98***d* in a visual surroundings as shown, VSADO Unit **100** may learn Smartphone's **98***a* operation in the visual surrounding by correlating Digital Pictures **525** of Smartphone's **98***a* surrounding with one or more Instruction Sets **526** used or executed by Processor **11**, Application Program **18**, and/or other processing element. Any Extra Info **527** related to Smartphone's **98***a* operation may also optionally be correlated with Digital Pictures **525** of Smartphone's **98***a* surrounding. VSADO Unit **100** may store this knowledge into Knowledgebase **530** (i.e. Neural Network **530***a*, Graph **530***b*, Collection of Sequences **530***c*, Sequence **533**, Collection of Knowledge Cells **530***d*, etc.). In the future, VSADO Unit **110** may compare incoming Digital Pictures **525** of Smartphone's **98***a* surrounding with previously learned Digital Pictures **525** including optionally using any Extra Info **527** for enhanced decision making. If substantially similar or at least a partial match is found or determined, the Instruction Sets **526** correlated with the previously learned Digital Pictures **525** can be autonomously executed by Processor **11**, Application Program **18**, and/or other processing element, thereby enabling autonomous operation of Smartphone **98***d* in a similar visual surrounding as in a previously learned one. For instance, Smartphone **98***d* comprising VSADO Unit **100** may learn User's **50** setting of Smartphone **98***d* on vibrate mode in a visual surrounding that includes a classroom. In the future, when visual surrounding that includes a classroom is encountered, or when classroom is detected, Smartphone **98***d* may implement vibrate setting autonomously. In some aspects, similar functionality can be utilized in visual surroundings that include a house of worship, cemetery, and/or others.

In some embodiments, VSADO Unit **100** can be used to enable Smartphone **98***d*, computer, and/or application to learn User's **50** movements for interacting with or controlling Smartphone **98***d*, computer, and/or application. In one example, while viewing a web page in a web browser running on Smartphone **98***d*, User **50** may perform a head nod during or after which User **50** may scroll down the web page. Smartphone **98***d* comprising VSADO Unit **100** may learn User's **50** scrolling of a web page in a visual surrounding that includes User **50** performing a head nod. In the future, when visual surrounding that includes User **50** performing a head nod is encountered or detected, Smartphone **98***d* may implement scrolling of a web page in a web browser autonomously. In another example, while operating a user controllable object (i.e. avatar, etc.) in a computer game running on Smartphone **98***d*, User **50** may lean right during or after which User **50** may direct the user controllable object to turn or steer right. Smartphone **98***d* comprising VSADO Unit **100** may learn User's **50** directing the user controllable object to turn or steer right in a visual surrounding that includes User **50** leaning right. In the future, when visual surrounding that includes User **50** leaning right is encountered or detected, Smartphone **98***d* may implement directing the user controllable object to turn or steer right in a computer game autonomously. Therefore, VSADO Unit **100** can spontaneously learn both User's **50** movements and Instruction Sets **526** implementing an operation without User **50** needing to program, manually designate, or otherwise assign the movements to Instruction Sets **526** implementing the operation. Such functionality enables learning of User **50**-chosen movements and User **50**-chosen operations seamlessly as User **50** operates a device, application, and/or object thereof in real life situations without the need for special training sessions. Any User's **50** movements can be utilized examples of which include moving head, moving facial parts (i.e. eyes, lips, etc.), moving shoulders, moving hands, moving hand parts (i.e. fingers, etc.), moving body, moving body parts (i.e. arms, legs, etc.), and/or others. Any of the functionalities described with respect to Smartphone **98***d* similarly apply to any computer or computing enabled device.

It must be noted that as used herein and in the appended claims, the singular forms "a", "an", and "the" include plural referents unless the context clearly dictates otherwise.

A number of embodiments have been described herein. While this disclosure contains many specific implementation details, these should not be construed as limitations on the scope of any inventions or of what may be claimed, but rather as descriptions of features specific to particular embodiments. It should be understood that various modifications can be made without departing from the spirit and scope of the invention. The logic flows depicted in the figures do not require the particular order shown, or sequential order, to achieve desirable results. In addition, other or additional steps, elements, or connections can be included, or some of the steps, elements, or connections can be eliminated, or a combination thereof can be utilized in the described flows, illustrations, or descriptions. Further, the various aspects of the disclosed devices, apparatuses, systems, and/or methods can be combined in whole or in part with each other to produce additional implementations. Moreover, separation of various components in the embodiments described herein should not be understood as requiring such separation in all embodiments, and it should be understood that the described components can generally be integrated together in a single software product or packaged into multiple software products. Accordingly, other embodiments are within the scope of the following claims.

The invention claimed is:

1. A system comprising:

one or more processors; and

one or more non-transitory machine readable media storing machine readable code that, when executed by the one or more processors, causes the one or more processors to perform at least:

receiving or generating a first one or more digital pictures, wherein the first one or more digital pictures depict at least a portion of a first device's surrounding;

receiving or generating a first one or more instruction sets for operating the first device; and

learning the first one or more digital pictures correlated with the first one or more instruction sets for operating the first device.

2. The system of claim **1**, wherein the receiving the first one or more digital pictures includes receiving the first one or more digital pictures from a picture capturing apparatus, and wherein the receiving the first one or more instruction sets for operating the first device includes receiving the first one or more instruction sets for operating the first device from: an application for operating the first device, a system for operating the first device, one or more microcontrollers, another one or more processors, or one or more actuators, and wherein the learning the first one or more digital pictures correlated with the first one or more instruction sets for operating the first device includes storing the first one or more digital pictures correlated with the first one or more

instruction sets for operating the first device into or onto at least one of: at least one non-transitory machine readable medium of the one or more non-transitory machine readable media, another one or more non-transitory machine readable media, one or more volatile memories, one or more non-volatile memories, one or more storage devices, or one or more storage systems.

3. The system of claim **1**, wherein the learning the first one or more digital pictures correlated with the first one or more instruction sets for operating the first device includes determining that the first one or more instruction sets for operating the first device temporally correspond to the first one or more digital pictures.

4. The system of claim **1**, wherein the machine readable code, when executed by the one or more processors, causes the one or more processors to further perform at least:

receiving or generating a new one or more digital pictures;

determining the first one or more instruction sets for operating the first device based on at least partial match between the new one or more digital pictures and the first one or more digital pictures; and

at least in response to the determining, causing the first device or a second device to perform one or more operations defined by the first one or more instruction sets for operating the first device.

5. The system of claim **4**, wherein the causing the first device or the second device to perform the one or more operations defined by the first one or more instruction sets for operating the first device includes executing the first one or more instruction sets for operating the first device.

6. The system of claim **4**, wherein the determining the first one or more instruction sets for operating the first device based on the at least partial match between the new one or more digital pictures and the first one or more digital pictures includes determining at least partial match between one or more portions of the new one or more digital pictures that represent one or more objects and one or more portions of the first one or more digital pictures that represent one or more objects.

7. The system of claim **4**, wherein the determining the first one or more instruction sets for operating the first device based on the at least partial match between the new one or more digital pictures and the first one or more digital pictures includes determining at least partial match between one or more objects detected in the new one or more digital pictures and one or more objects detected in the first one or more digital pictures.

8. The system of claim **4**, wherein the first one or more instruction sets for operating the first device include one or more information about one or more states of: the first device, or a portion of the first device.

9. The system of claim **4**, wherein the first one or more digital pictures correlated with the first one or more instruction sets for operating the first device are included in a knowledgebase, and wherein the knowledgebase further includes a second one or more digital pictures correlated with a second one or more instruction sets for operating the first device, and wherein at least a portion of the first one or more digital pictures or at least a portion of the first one or more instruction sets for operating the first device is learned in a first learning process that includes operating the first device at least partially by a first user, and wherein at least a portion of the second one or more digital pictures or at least a portion of the second one or more instruction sets for operating the first device is learned in a second learning process that includes operating the first device at least partially by the first user.

10. The system of claim **4**, wherein the first one or more digital pictures correlated with the first one or more instruction sets for operating the first device are included in a knowledgebase, and wherein the knowledgebase further includes a second one or more digital pictures correlated with a second one or more instruction sets for operating the first device, and wherein at least a portion of the first one or more digital pictures or at least a portion of the first one or more instruction sets for operating the first device is learned in a first learning process that includes operating the first device at least partially by a first user, and wherein at least a portion of the second one or more digital pictures or at least a portion of the second one or more instruction sets for operating the first device is learned in a second learning process that includes operating the first device at least partially by a second user.

11. The system of claim **4**, wherein the first one or more digital pictures correlated with the first one or more instruction sets for operating the first device are included in a knowledgebase, and wherein the knowledgebase further includes a second one or more digital pictures correlated with a second one or more instruction sets for operating a third device, and wherein at least a portion of the first one or more digital pictures or at least a portion of the first one or more instruction sets for operating the first device is learned in a first learning process that includes operating the first device at least partially by a first user, and wherein at least a portion of the second one or more digital pictures or at least a portion of the second one or more instruction sets for operating the third device is learned in a second learning process that includes operating the third device at least partially by: the first user, or a second user.

12. The system of claim **4**, wherein the new one or more digital pictures depict at least a portion of the first device's surrounding, and wherein the first one or more instruction sets for operating the first device are applied to the first device, and wherein the first device is caused to perform the one or more operations defined by the first one or more instruction sets for operating the first device.

13. The system of claim **4**, wherein the new one or more digital pictures depict at least a portion of the second device's surrounding, and wherein the first one or more instruction sets for operating the first device are applied to the second device, and wherein the second device is caused to perform the one or more operations defined by the first one or more instruction sets for operating the first device.

14. The system of claim **4**, wherein the new one or more digital pictures depict at least a portion of the second device's surrounding, and wherein the first one or more instruction sets for operating the first device or a copy of the first one or more instruction sets for operating the first device are modified and applied to the second device, and wherein the second device is caused to perform one or more operations defined by: the modified the first one or more instruction sets for operating the first device, or the modified the copy of the first one or more instruction sets for operating the first device.

15. The system of claim **4**, wherein the machine readable code, when executed by the one or more processors, causes the one or more processors to further perform at least:

modifying:

the first one or more instruction sets for operating the first device, or

a copy of the first one or more instruction sets for operating the first device, and wherein the determining the first one or more instruction sets for operating the first device based on the at least partial match between the new one or more digital pictures and the first one or more digital pictures includes:

determining the modified the first one or more instruction sets for operating the first device based on the at least partial match between the new one or more digital pictures and the first one or more digital pictures, or

determining the modified the copy of the first one or more instruction sets for operating the first device based on the at least partial match between the new one or more digital pictures and the first one or more digital pictures, and wherein the causing the first device or the second device to perform the one or more operations defined by the first one or more instruction sets for operating the first device includes:

causing the first device or the second device to perform one or more operations defined by the modified the first one or more instruction sets for operating the first device, or

causing the first device or the second device to perform one or more operations defined by the modified the copy of the first one or more instruction sets for operating the first device.

16. The system of claim **4**, wherein the machine readable code, when executed by the one or more processors, causes the one or more processors to further perform at least:

modifying at least one of: the first one or more digital pictures, a copy of the first one or more digital pictures, the new one or more digital pictures, or a copy of the new one or more digital pictures, and wherein the at least partial match between the new one or more digital pictures and the first one or more digital pictures includes: (i) at least partial match between the modified the new one or more digital pictures and the first one or more digital pictures, (ii) at least partial match between the modified the copy of the new one or more digital pictures and the first one or more digital pictures, (iii) at least partial match between the new one or more digital pictures and the modified the first one or more digital pictures, (iv) at least partial match between the new one or more digital pictures and the modified the copy of the first one or more digital pictures, (v) at least partial match between the modified the new one or more digital pictures and the modified the first one or more digital pictures, (vi) at least partial match between the modified the copy of the new one or more digital pictures and the modified the copy of the first one or more digital pictures, (vii) at least partial match between the modified the new one or more digital pictures and the modified the copy of the first one or more digital pictures, or (viii) at least partial match between the modified the copy of the new one or more digital pictures and the modified the first one or more digital pictures.

17. The system of claim **4**, wherein the machine readable code, when executed by the one or more processors, causes the one or more processors to further perform at least:

modifying:

the first one or more digital pictures, or

a copy of the first one or more digital pictures, and wherein the learning the first one or more digital pictures correlated with the first one or more instruction sets for operating the first device includes:

learning the modified the first one or more digital pictures correlated with the first one or more instruction sets for operating the first device, or

learning the modified the copy of the first one or more digital pictures correlated with the first one or more instruction sets for operating the first device, and wherein the determining the first one or more instruction sets for operating the first device based on the at least partial match between the new one or more digital pictures and the first one or more digital pictures includes:

determining the first one or more instruction sets for operating the first device based on at least partial match between the new one or more digital pictures and the modified the first one or more digital pictures, or

determining the first one or more instruction sets for operating the first device based on at least partial match between the new one or more digital pictures and the modified the copy of the first one or more digital pictures.

18. The system of claim **4**, wherein the machine readable code, when executed by the one or more processors, causes the one or more processors to further perform at least:

modifying:

the first one or more instruction sets for operating the first device, or

a copy of the first one or more instruction sets for operating the first device, and wherein the learning the first one or more digital pictures correlated with the first one or more instruction sets for operating the first device includes:

learning the first one or more digital pictures correlated with the modified the first one or more instruction sets for operating the first device, or

learning the first one or more digital pictures correlated with the modified the copy of the first one or more instruction sets for operating the first device, and wherein the determining the first one or more instruction sets for operating the first device based on the at least partial match between the new one or more digital pictures and the first one or more digital pictures includes:

determining the modified the first one or more instruction sets for operating the first device based on the at least partial match between the new one or more digital pictures and the first one or more digital pictures, or

determining the modified the copy of the first one or more instruction sets for operating the first device based on the at least partial match between the new one or more digital pictures and the first one or more digital pictures, and wherein the causing the first device or the second device to perform the one or more operations defined by the first one or more instruction sets for operating the first device includes:

causing the first device or the second device to perform one or more operations defined by the modified the first one or more instruction sets for operating the first device, or

causing the first device or the second device to perform one or more operations defined by the modified the copy of the first one or more instruction sets for operating the first device.

19. The system of claim **4**, wherein the system further comprising:

an artificial intelligence system, and wherein the learning the first one or more digital pictures correlated with the first one or more instruction sets for operating the first

device includes learning, at least in part by the artificial intelligence system, the first one or more digital pictures correlated with the first one or more instruction sets for operating the first device, and wherein the determining the first one or more instruction sets for operating the first device based on the at least partial match between the new one or more digital pictures and the first one or more digital pictures includes determining, at least in part by the artificial intelligence system, the first one or more instruction sets for operating the first device based on the at least partial match between the new one or more digital pictures and the first one or more digital pictures.

20. The system of claim **19**, wherein the artificial intelligence system includes: one or more inputs for receiving one or more digital pictures, and one or more outputs for providing one or more instruction sets, and wherein the learning, at least in part by the artificial intelligence system, the first one or more digital pictures correlated with the first one or more instruction sets for operating the first device includes applying the first one or more digital pictures to the inputs of the artificial intelligence system, and wherein the determining, at least in part by the artificial intelligence system, the first one or more instruction sets for operating the first device based on the at least partial match between the new one or more digital pictures and the first one or more digital pictures includes:

applying the new one or more digital pictures to the inputs of the artificial intelligence system; and

receiving the first one or more instruction sets for operating the first device from the outputs of the artificial intelligence system.

21. The system of claim **20**, wherein the one or more inputs for receiving the one or more digital pictures include: one input for one digital picture, multiple inputs for multiple digital pictures, one input for one portion of one digital picture, multiple inputs for multiple portions of one digital picture, multiple inputs for multiple portions of multiple digital pictures, an input for one representation of one digital picture, multiple inputs for multiple representations of multiple digital pictures, one input for one representation of one portion of one digital picture, multiple inputs for multiple representations of multiple portions of one digital picture, or multiple inputs for multiple representations of multiple portions of multiple digital pictures.

22. The system of claim **19**, wherein the artificial intelligence system includes: a knowledgebase, or a neural network.

23. The system of claim **4**, wherein the first one or more digital pictures correlated with the first one or more instruction sets for operating the first device include the first one or more digital pictures connected, using at least one or more connections, with the first one or more instruction sets for operating the first device.

24. The system of claim **4**, wherein the first one or more digital pictures are: one or more whole digital pictures, one or more representations of one or more whole digital pictures, one or more portions of at least one digital picture, one or more representations of one or more portions of at least one digital picture, one or more features, one or more representations of one or more features, one or more collections of pixels, or one or more collections of values, and wherein the new one or more digital pictures are: one or more whole digital pictures, one or more representations of one or more whole digital pictures, one or more portions of at least one digital picture, one or more representations of one or more portions of at least one digital picture, one or more features, one or more representations of one or more features, one or more collections of pixels, or one or more collections of values.

25. The system of claim **4**, wherein the system further comprising:

a server that receives from the first device at least one of: the first one or more digital pictures, or the first one or more instruction sets for operating the first device, and wherein the second device receives from the server at least one of: the first one or more digital picture % or the first one or more instruction sets for operating the first device, and wherein the second device is caused to perform the one or more operations defined by the first one or more instruction sets for operating the first device.

26. The system of claim **4**, wherein at least some elements of the system are included in: a single device, or multiple devices, and wherein the one or more processors include: one or more microcontrollers, one or more computing devices, or one or more electronic devices, and wherein the first device includes a robot, a vehicle, an appliance, an electronic device, or a mechanical machine, and wherein the second device includes a robot, a vehicle, an appliance, an electronic device, or a mechanical machine, and wherein the first one or more digital pictures include: one or more still digital pictures, or one or more motion digital pictures, and wherein the new one or more digital pictures include: one or more still digital pictures, or one or more motion digital pictures, and wherein an instruction set of the first one or more instruction sets for operating the first device includes at least one of: only one instruction, a plurality of instructions, one or more inputs, one or more commands, one or more keywords, one or more symbols, one or more operators, one or more variables, one or more parameters, one or more characters, one or more numbers, one or more values, one or more signals, one or more binary bits, one or more functions, one or more function references, one or more objects, one or more object references, one or more data structures, one or more data structure references, one or more states, one or more representations of one or more states, one or more representations of one or more user inputs, one or more codes, one or more data, or one or more information.

27. The system of claim **4**, wherein the first one or more digital pictures correlated with the first one or more instruction sets for operating the first device are included in a knowledgebase, and wherein the knowledgebase further includes a second one or more digital pictures correlated with a second one or more instruction sets for operating a third device, and wherein the machine readable code, when executed by the one or more processors, causes the one or more processors to further perform at least:

receiving or generating an additional one or more digital pictures;

determining the second one or more instruction sets for operating the third device based on at least partial match between the additional one or more digital pictures and the second one or more digital pictures; and

at least in response to the determining the second one or more instruction sets for operating the third device, causing a fourth device to perform one or more operations defined by the second one or more instruction sets for operating the third device.

28. The system of claim **4**, wherein the at least partial match between the new one or more digital pictures and the first one or more digital pictures is at least in part based on

a product of one or more values that represent one or more portions of the new one or more digital pictures and one or more values that represent one or more portions of the first one or more digital pictures.

29. The system of claim **4**, wherein the generating the new one or more digital pictures includes:

detecting one or more objects in the first device's surrounding or the second device's surrounding;

generating one or more representations of the one or more objects; and

generating the new one or more digital pictures that include the one or more representations of the one or more objects.

30. The system of claim **29**, wherein the detecting the one or more objects in the first device's surrounding or the second device's surrounding includes detecting at least one or more locations of the one or more objects, and wherein the new one or more digital pictures include a top-down view of the one or more representations of the one or more objects.

31. The system of claim **4**, wherein the generating the first one or more instruction sets for operating the first device includes generating the first one or more instruction sets for operating the first device as one or more representations of a second one or more instruction sets for operating the first device.

32. The system of claim **4**, wherein the first one or more digital pictures that depict the at least the portion of the first device's surrounding include one or more digital pictures that depict a representation of the at least the portion of the first device's surrounding.

33. A method implemented using a computing system that includes one or more processors, the method comprising:

receiving or generating a first one or more digital pictures, wherein the first one or more digital pictures depict at least a portion of a first device's surrounding;

receiving or generating a first one or more instruction sets for operating the first device; and

learning the first one or more digital pictures correlated with the first one or more instruction sets for operating the first device.

34. A system comprising:

means for receiving or generating a first one or more digital pictures, wherein the first one or more digital pictures depict at least a portion of a first device's surrounding;

means for receiving or generating a first one or more instruction sets for operating the first device; and

means for learning the first one or more digital pictures correlated with the first one or more instruction sets for operating the first device.

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